DRAFT SOCIOECONOMIC REPORT FOR THE 2003 AQMP

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SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

DRAFT SOCIOECONOMIC REPORT FOR 2003 AIR QUALITY MANAGEMENT PLAN

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The draft 2003 Air Quality Management Plan (AQMP or Plan) has been prepared to meet the challenge of achieving healthful air quality in the South Coast Air Basin (Basin) and the Coachella valley. This report accompanies the AQMP and presents the potential socioeconomic impacts resulting from this Plan. The information contained herein is considered by the South Coast Air Quality Management District (AQMD) Governing Board when determining whether or not to approve the Plan.

The draft Plan contains several short- and long-term strategies designed to achieve ambient air quality standards and state and federal air quality planning requirements. These strategies will be implemented by the AQMD, local and regional governments, the California Air Resources Board (CARB), and the U.S. Environmental Protection Agency (U.S. EPA). Implementation of these control strategies will affect the region's economy.

The AQMD relies on a number of methods, tools, and data sources to determine the impact of proposed control strategies on the economy. These tools include the following: air quality models and concentration-response relationships to estimate benefits of clean air; costs and emission reductions to calculate the efficiency of the draft Plan; the REMI (Regional Economic Models, Inc.) model to assess any potential employment and other socioeconomic impacts; the 1990 and 2000 census data and the Current Population Survey to assess how employment impacts affect ethnic groups; and the consumer expenditure survey and changes in product prices to examine the impact on consumer price indexes by income group.

Based on the methods and tools described above, the socioeconomic assessment attempts to answer the following important questions.

What Are the Benefits of the 2003 AQMP?

In recent years, there have been significant improvements in air quality in the Basin. Additional control is still needed in order to bring the Basin into compliance with the federal air quality standards. The benefits of better air quality through implementation of the draft 2003 AQMP include increases in crop yields, visibility improvements, and a reduction in morbidity, higher survival rates, reduced expenditures on refurbishing building surfaces, and reduced traffic congestion.

Compliance with the federal PM10 and ozone standards and the state visibility standard is projected to result in an average annual benefit of $7.4 billion. The $7.4 billion includes roughly $1.9 billion for averted illness and higher survival rates, $3.9 billion for visibility improvements, $70 million for reduced damage to materials, $19 million for increased crop yields, and $1.5 billion for congestion relief.

Not all of the benefits associated with the implementation of the draft Plan can be quantified. The health benefits which were quantified do not account for reduced emissions from pollutants other than PM10 and ozone. Neither have reductions in vehicle hours traveled for personal trips and damages to plants, livestock, and forests been quantified. Further research is needed before the benefits of these effects of the 2003 AQMP can be quantified. The total benefits of the draft Plan are, therefore, expected to exceed $7.4 billion.

What Is the Total Implementation Cost of the Draft 2003 AQMP?

The projected annual implementation cost of the draft Plan is $3.1 billion annually, on average. The cost estimate is divided into quantifiable and unquantifiable measures.

The projected cost for 36 short-term quantifiable measures is approximately $1.64 billion. Transportation control measures alone contribute to 56 percent of the total quantifiable cost. The cost of unquantifiable measures is projected to be approximately $1.43 billion. The cost of unquantified measures was derived from emission reductions in 2010 and the average cost effectiveness of quantifiable measures.

The cost of quantified measures represents only 30 percent of emission reductions intended for attainment. A sensitivity test rendered on the unquantified measures shows that the total cost of the draft Plan could range from a low of $2.1 to a high of $4.2 billion annually, on average. Additional efforts will be made to quantify the costs associated with all control measures before the next AQMP revision.

What Is the Cost of the Draft 2003 AQMP as Compared to the Benefits?

The cost of quantifiable measures was based on the prices of equipment and materials that would be required for its implementation. The cost of unquantified measures was assessed based on the average cost effectiveness of quantified measures. Since quantifiable measures represent only 30 percent of emissions reductions, questions have been raised about the appropriateness of this approach. This is because as the AQMD comes closer to its attainment goals for various pollutants, the cost in achieving the final increment towards attainment might actually result in higher costs than projected. It is also not clear whether the costs associated with maintaining attainment of various pollutants will be reflective of the currently projected costs. On the other hand, historically actual costs are generally thought to be lower than the projected costs due to cost reductions resulting from techonological advancement over time.

The measurement of clean air benefits is performed indirectly since clean air is not a commodity purchased or sold in a market. This often results in incomplete and underestimated benefits. The benefits of clean air (based on the total emission reductions required for attainment) for which a monetary figure can be applied are $7.4 billion as compared to the costs of $3.1 billion on an average annual basis. There are, however, many benefits which are still unaccounted for, such as reductions in chronic illness and lung function impairment in human beings as well as reduced damage to livestock and plant life, erosion of building materials, and the value of reduced vehicle hours traveled for personal trips. When all these are considered, the estimated benefits will further outweigh the costs.

What Effect Will the Plan Have on Employment?

The employment impact analysis was performed separately for quantified control measures and clean air benefits resulting from the attainment of air quality standards (federal 1-hour ozone and PM10 and state visibility standards) since quantified control measures represent only 30 percent of the total emission reductions required for meeting the air quality standards and quantification of benefits includes all the intended emission reductions. As such, the employment impacts from quantified measures and benefits should be viewed separately.

Without the AQMP, jobs in the four-county area are projected to grow at an annual rate of about 1.069 percent between 2002 and 2020. Cleaner air would result in 33,372 jobs created annually, on average. This would bring the job growth rate to an annual rate of 1.098 percent. On the other hand, the quantified measures are projected to result in 10,523 jobs forgone annually, on average, which would slow down the job growth rate to 1.053 percent relative to the baseline employment. The four-county region is projected to have 11 million jobs in 2020. The jobs created from clean air benefits would amount to 0.55 percent of the 2020 baseline jobs. The jobs forgone from quantified measures would be 0.2 percent of the 2020 baseline jobs.

The medical sector would experience jobs forgone due to reductions in illness from cleaner air. The industries of construction and auto repair services and manufacturers of transportation equipment would experience additional jobs created due to additional demand for their products as required by on- and off-road control measures.

The employment impacts associated with unquantified measures will be examined further as the costs of these measures are estimated in more detail. In addition, as measures are developed into rules, their potential employment impacts will be specifically assessed.

What Are the Potential Impacts on Socioeconomic Groups and Ethnic Communities?

Implementation of the draft 2003 AQMP is projected to result in air quality improvements sufficient to attain the air quality standards by 2010 throughout the Basin. The air quality modeling results have, however, shown the greatest relative improvements and air quality benefit in the eastern portion of the Basin. The San Gabriel Valley is shown to have the greatest share of the monetary value of these improvements. A demographic analysis of the 2000 census showed that 46 percent of the population there is Hispanics. Higher concentration of Hispanics is also expected in the future throughout the four-county area. The Hispanic population is consequently expected to benefit extensively from the draft Plan.

The attainment of the air quality standards in 2010 depends on a full implementation of control measures, as proposed in the draft 2003 AQMP. The costs of these measures will spread throughout various communities. The cost of quantified control measures that represent 30 percent of the total emission reductions towards clean air would exert a relatively higher share on the southern portion of Los Angeles County and the Chino-Redlands area than the rest of the communities.

All the 19 sub-regions are projected to have additional jobs created from cleaner air. All the ethnic groups are expected to have job gains as a result. The share of Whites and Hispanics in job gains is projected to be 84 percent. Implementation of quantified control measures would also result in additional jobs to be created between 2002 and 2006 of which Whites are projected to have a 54 percent share and Hispanics would have a 32 percent share. In later years (2007 to 2020), these measures would result in an average of 20,614 jobs forgone annually of which the share of Hispanics is 25 percent.

Job gains from cleaner air would vary slightly among five wage groups comprised of 94 occupations. There is no significant difference in impacts on the price of consumption goods from one income group to another.

What Effect Will the Plan Have on Industrial Competitiveness?

The draft socioeconomic report examines industrial competitiveness in three areas: the Basin's share of national jobs, product prices and profits, and exports and imports. The quantified measures and benefits of the draft 2003 AQMP are not expected to result in discernible differences in the four-county region's share of national jobs. For the majority of sectors, the impact on product prices is projected to be less than one-half of one percent of the baseline index of product prices and the impact on profits is projected to be less than one-half of one percent of the baseline index of profits. The impact on imports and exports is small as well, especially when the size of the four-county region is considered.

The competitiveness analysis of the draft Plan focuses on its impact on various sectors of the local economy. Individual control measures could result in impacts on individual companies. Competitiveness at the company level will be analyzed during individual rule adoption proceedings.

Competing regions tend to follow the South Coast Basin and adopt similar control measures, thereby reducing potential imbalances. The costs of the unquantified measures may affect competitiveness if they are implemented solely in the South Coast region. At the same time, the socioeconomic analysis underestimates the benefits from clean air that would increase regional attractiveness.

Future research is required to assess the impact of innovation on competitiveness. In addition, the AQMD will examine the impact of proposed air quality regulations on competitiveness during the rulemaking process for each proposed rule.

Does This Analysis Affect the Selection of Possible Alternatives to the Draft 2003 AQMP?

Yes. The Socioeconomic Impact Report can affect the selection of possible alternatives to the proposed Plan as identified in the draft EIR. In considering whether to adopt the draft Plan or one of the alternatives the AQMD Governing Board will evaluate which alternative presents the best balance of greatest socioeconomic and environmental benefits and least adverse environmental and socioeconomic impacts.

The No Project alternative would not reach the attainment of air quality standards. All other alternatives display few variations in monetary costs than in monetary benefits, especially when uncertainty for the unquantified measures is considered.. Except for the No Project alternative, the job impact of quantified measures shows fewer variations among alternatives than that of quantified benefits.

What are the Key Areas of Uncertainty in This Assessment?

It is not possible at this time to quantify the costs associated with every control measure and all of the benefits associated with clean air. Of the 40 control measures required for attainment demonstration, 36 have quantifiable costs which represent only 30 percent of the total emission reductions. Costs for the remaining four measures are not available at this time because control methods, control efficiencies, emission reductions, or the costs of control technologies are not presently defined. In addition, it is also not possible at this time to quantify every beneficial effect of clean air.

The REMI model, which was used to analyze the impacts of the draft 2003 AQMP, projects possible impacts on jobs, the distribution of jobs, income, product prices, profits, exports, and imports based upon the input of cost data for each quantified control measure and the quantifiable benefit data for each effect of clean air. The reliability of such projections is dependent upon the validity of the input.

The relatively large size of emission reductions from unquantified measures and the limited data currently available do not lend themselves to carry forward such projections for unquantified measures. To determine the potential impacts as described above, therefore, only the quantified measures and benefits are utilized. This analysis is performed separately for quantified measures and clean air benefits because the cost of these measures reflects only 30 percent of the total emission reductions while 100 percent of emission reductions were included in attainment demonstration in air quality models. Changes in pollutant concentrations from these models serve the basis for clean air benefit assessments which then become input to the REMI model.

What Efforts Will Be Taken to Refine the AQMD's Socioeconomic Analyses?

Several powerful tools have been developed to determine the socioeconomic impacts of the draft 2003 AQMP. However, additional data and research are still required. Table ES-1 shows the enhancements achieved since the 1997 AQMP socioeconomic analysis and future research efforts that the AQMD plans to take before the next AQMP.

TABLE ES-1

Enhancements Achieved and Proposed for Future Action

Topic	Achieved	Proposed for Future
Benefit **Quantitative & Qualitative Benefit Assessments**	• Quantify benefits from reductions in vehicle hours traveled. • Assess benefits for greater geographical details • Update the visibility benefit estimate. • Establish air quality research center to further assess health impacts.	• Estimate changes in life expectancy (1997).[1] • Separate multiple pollutant effects (1997). • Examine at-risk population (1997).
Cost **Evaluation of Costs and Flexible Regulatory Approaches**	• Quantify costs at source locations. • Continue the use of the mitigation fee and emission fee concepts.	• Examine differences between command-and-control regulations and pricing or subsidies (1994).[2] • Work with the CARB to examine post rule costs.
Distributional Impacts **Geographic Information System (GIS)**	• Develop facility based assessment to analyze specific segments of affected industries. • Analyze macroeconomic impacts at sub-county level for differential impacts.	• Produce more detailed sub-region analyses through GIS. • Merge air quality, land use, and socioeconomic models.
Competitiveness **Impact of Regional Regulations on Competitiveness**	• Use firm and industry profiles to perform segmentation study of an industry.	• Assess the impact of innovation on competitiveness. (1994) • Build time series data base for trend analysis. • Convert to NAICS for comparable statistics.

[1]Origionally proposed in the 1997 AQMP Socioeconomic Report.
[2]Origionally proposed in the 1994 AQMP Socioeconomic Report.

CHAPTER 1

INTRODUCTION

Introduction

Draft 2003 AQMP

Legal Requirements

2003 AQMP Socioeconomic Issues

Assessment Methodology

INTRODUCTION

The draft 2003 Air Quality Management Draft Plan (AQMP or Draft Plan) is designed to meet the challenge of achieving clean air in Southern California. The draft Plan proposes strategies and programs aimed at both a healthy environment and economy. The costs of implementing this draft Plan and the associated benefits of achieving clean air standards are the subject of this report. The purpose of this assessment is to define and present the potential socioeconomic impacts related to the draft 2003 AQMP.

DRAFT 2003 AQMP

The draft 2003 AQMP is a comprehensive draft Plan designed to achieve federal ambient air quality standards required by the federal Clean Air Act for the South Coast Air Basin (Basin) and those portions of the Salton Sea Air Basin that are under the AQMD's jurisdiction (namely the Coachella Valley). This revision began with the remaining control strategies in the 1997/1999 State Implementation Draft Plan (SIP), then expanded to new strategies based on current technology assessments. These new control strategies continue to focus on reducing emissions from NOx and VOC—ozone precursors—as well as particulate matter (PM).

The focus of the draft 2003 AQMP is to demonstrate attainment with federal and state standards for PM10 by 2006 and for ozone by 2010 as well as continued progress towards federal and state 8-hour ozone and PM2.5 standards. The draft 2003 AQMP combines a traditional command-and-control approach facilitated by market incentive programs and advanced technology to be implemented by 2010. Previous long term measures from the 1997 AQMP have been redrafted into short term measures with specified SIP reduction requirements. Short- and long-term control strategies are proposed and will be implemented by the AQMD, local and regional governments, the California Air Resources Board (ARB), and the U.S. Environmental Protection Agency (EPA). The short-term strategy is made up of control measures that rely on known technology and are proposed to be implemented between 2004 and 2010. While implementation of these measures provides considerable improvements in air quality, further emission reductions are needed to ultimately achieve the ambient air quality standards. Therefore, the draft Plan also proposes several long-term measures to be implemented between 2005 and 2010. Some of these measures rely on the advancement of technologies that are currently unavailable for commercial use but are "on the horizon" of development. Others, such as the retirement of old vehicles and in-use engine retrofit technology, would require funding to make them more plausible.

Furthermore, the AQMD has proposed to expand its regulatory program to mobile sources, in some cases, pending additional legal authority. These proposed mobile source measures include a mitigation fee type program for federally mandated sources (e.g. trains, planes, and trucks), an emission fee program for port-related vehicles, and regulations for in-use off-road vehicles. These measures would be implemented between 2008 and 2010.

The implementation of short- and long-term measures will produce both direct and secondary positive and adverse impacts on the community and economy of the 19 sub-county regions. Direct impacts include costs such as expenditures on pollution control equipment, transportation infrastructure, and reformulated products. Direct impacts also include benefits such as decreased medical costs due to better air quality and increased crop yields. Secondary impacts are the spillover impacts of direct costs and benefits as a result of interactions between industries and consumers in the 19 sub-county regions.

LEGAL REQUIREMENTS

As part of the 1989 AQMP approval, the AQMD Governing Board passed a resolution that called for AQMD staff to prepare an economic analysis of emission reduction rules proposed for adoption or amendment. Elements to be included in the analysis include identification of affected industries, cost effectiveness of control, and public health benefits.

In addition, Health and Safety Code Section 40440.8, which took effect on January 1, 1991, requires a socioeconomic analysis of each AQMD rule that has significant emission reduction potential. In addition to the elements required under the AQMD's resolution, Section 40440.8 requires the AQMD to estimate employment impacts and to perform socioeconomic analyses of the project alternatives developed pursuant to the California Environmental Quality Act (CEQA).

Health and Safety Code Section 40728.5 requires that the Governing Board actively consider any socioeconomic impacts in its rule adoption proceedings. Health and Safety Code Section 39616 requires the AQMD to ensure that any market incentive strategies it adopts result in lower or equivalent overall costs and job impacts, (i.e., no significant shift from high-paying to low-paying jobs), when compared with command-and-control regulations. Health and Safety Code Section 40920.6 (Assembly Bill 456), which became effective on January 1, 1996, requires that incremental cost effectiveness (difference in costs divided by difference in emission reductions) be performed whenever more than one control option is feasible to meet control requirements.

None of these requirements apply to the preparation of the AQMP. However, the AQMD has elected to perform a socioeconomic analysis of the draft Plan in order to further inform public discussions of the draft Plan.

Current Socioeconomic Analysis Program

The AQMD continually seeks to improve its analysis of socioeconomic impacts by expanding its methods and tools. Over the years, the AQMD's socioeconomic analyses have diversified and evolved as shown in Figure 1-1. The AQMD relies on both quantitative and qualitative analyses, describes impacts in absolute and relative terms, and has continually refined its analysis to a more detailed level. In addition, the AQMD is beginning to use facility-based and sub-industry data to better identify the underlying socioeconomic characteristics of various sizes of affected industries historically. Such analysis becomes an important analytic tool in situations where proposed regulations disproportionately impact small or minority owned businesses.

The Massachusetts Institute of Technology (MIT) conducted an audit of the AQMD's socioeconomic impact analysis program (Polenske et al., 1992). This audit found that the AQMD surpassed most other agencies in analytical methods. The audit did, however, recommend that the AQMD use alternative approaches and work with the regulated community

Figure 1-1
Evolution of Socioeconomic Analysis

1. Cost Effectiveness
2. Affected Sources

Pre-1989

1. Cost Effectiveness
2. Affected Sources
3. Affected Industries
4. Range of Control cost
5. Public Health Benefit

1989

1. Cost Effectiveness
2. Affected Sources
3. Affected Industries
4. Range of Control Cost
5. Public Health Benefit
6. Job & Other Socio Economic Impacts of CEQA Alternatives

1990-1991

1. Cost Effectiveness
2. Affected Sources
3. Affected Industries
4. Range of Control Cost
5. Public Health Benefit
6. Job & Other Economic impacts of CEQA Alternatives
7. High- vs Low- paying Job Impacts
8. CPI Impacts by Income Group
9. Relative & Absolute Impacts

1992

1. Cost Effectiveness
2. Affected Sources
3. Affected Industries
4. Range of Control Cost
5. Public Health Benefit
6. Job & Other Economic impacts of CEQA Alternatives
7. High- vs Low- paying Job Impacts
8. CPI Impacts by Income Group
9. Relative & Absolute Impacts
10. Individual Industry Studies
11. Cumulative Impacts of Rules
12. Impacts on 3- to 4- digit SIC
13. Sensitivity Test of Key Assumptions
14. Quantification of More Health Effects
15. Refined Visibility Benefit
16. Cost & Benefit Impacts for Sub-counties

1993-1996

1. Cost Effectiveness
2. Affected Sources
3. Affected Industries
4. Range of Control Cost
5. Public Health Benefit
6. Job & Other Economic Impacts of CEQA Alternatives
7. High- vs Low- paying Job Impacts
8. CPI Impacts by Income Group
9. Relative & Absolute Impacts
10. Individual Industry Studies
11. Cumulative Impacts of Rules
12. Impacts on 3- to 4-digit SIC
13. Sensitivity Test of Key Assumptions
14. Quantification of More Health Effects
15. Refined Visibility Benefit
16. Cost & Benefit Impacts for Sub-counties
17. New Visibility Study
18. Facility-based Analysis
19. Job & Other Economic Impacts for Sub-counties

1997-2003

and socioeconomic experts to refine its socioeconomic assessments. The Scientific, Technical and Modeling Peer Review Advisory Group (STMPRAG), the Ethnic Community Advisory Group (ECAG), and the Local Government and Small Business Assistance Advisory Group (LGSBAAG) have been involved in providing inputs and refinements to the socioeconomic assessments. STMPRAG is composed of leading experts in the socioeconomic and air quality modeling fields, representatives from the regulated community, and participants from public interest groups. ECAG consists of representatives from community groups, small businesses, and grass roots organizations who work extensively with their communities. LGSBAAG is made up of representatives from local governments and small businesses.

In 1998, the AQMD co-funded a visibility study with the most recent property sales data and census data for the four county area (Beron et al., 2001). Results indicated that strong relationship existed between the marginal willingness to pay for improved visibility (price of visibility) and educational level and household net income.

Towards the goal of expanding its analysis tools, in 2000, the AQMD commissioned BBC Research and Consulting to examine approaches to assessing impacts of proposed regulations on a spectrum of facilities and to evaluating impacts of rules after their adoption. The study results indicated the need to employ a variety of external data sources, construct internal time series data, and explore data sharing opportunities with other governmental agencies.

In preparation for work for the 2003 AQMP, the AQMD has consulted STMPRAG, ECAG, and LGSBAAG to discuss possible and future refinements to data collection, modeling, and socioeconomic processes. Such consultation will continue before the next AQMP for strengthening data sharing between air quality, socioeconomic, and land use models.

2003 AQMP SOCIOECONOMIC ISSUES

In addition to covering all the topics listed under the legal mandates above, this assessment will address the following issues and provide the best estimates of:

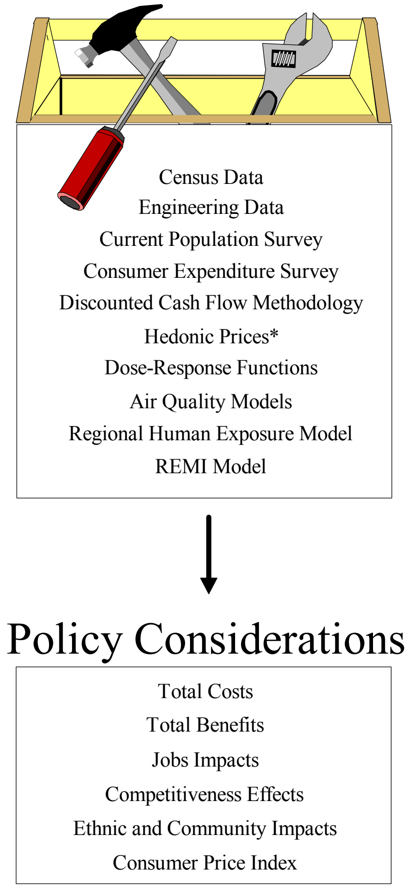
- Benefits of the 2003 AQMP;
- Total implementation cost of the 2003 AQMP;
- Cost of the 2003 AQMP as compared to the benefits;
- Effect of quantifiable measures and benefits of the draft Plan will have on employment;
- Potential impacts on sub-county areas and socioeconomic groups;
- Effect the draft Plan will have on industrial competitiveness;
- Economic effects of the alternatives to the draft 2003 AQMP; and
- Key areas of uncertainty in this assessment.

ASSESSMENT METHODOLOGY

To assess the socioeconomic impacts of the draft 2003 draft Plan, the AQMD has relied on a variety of data sources, methods, and tools (Figure 1-2). The analysis is divided into a number of segments whose interrelationship is shown in Figure 1-3. The analysis is performed at the sub-county level by grouping contiguous census tracts that have similar political, geographical, and social characteristics. Los Angeles County is sub-divided into 11 regions, Orange County four regions, and Riverside and San Bernardino Counties two of each.

FIGURE 1-2

Assessment Tool Kit

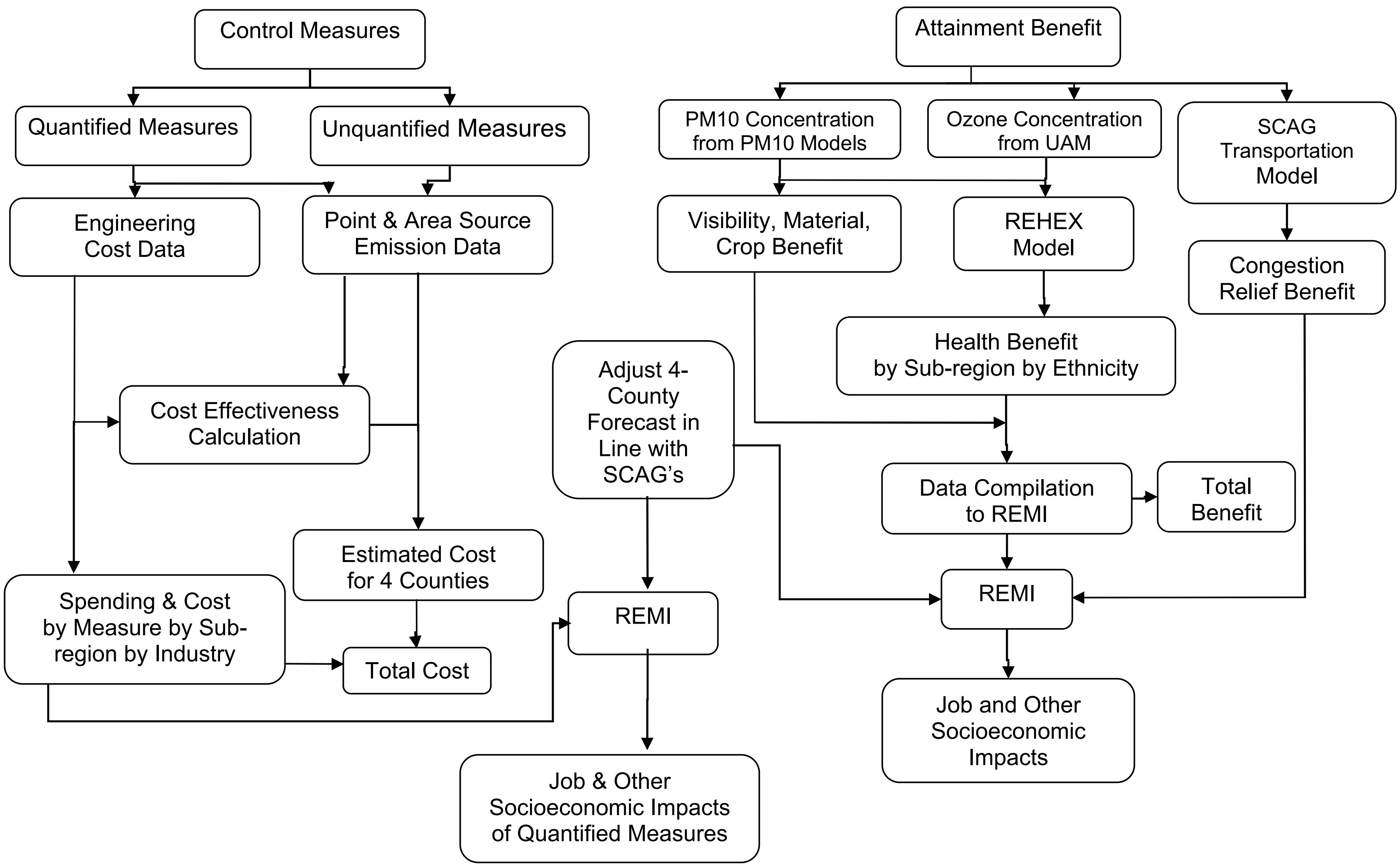


*See Glossary

The analysis period is from 2002 to 2020. This is to accommodate some transportation control measures that have been in place since 2002. Second, impacts of control measures will continue years after they are implemented. For example, there are a number of measures that will be implemented close to 2010. Some transportation measures will not come into the system until 2020; however, a portion of funds has been earmarked for their implementation.

A two-step process is utilized to estimate the benefits expected from attaining the federal 1-hour ozone and PM10 and state visibility standards. The first step involves translating the

Figure 1-3
AQMP Socioeconomic Analysis



improvements in air quality expected to result from the draft Plan into dollar values. The benefit categories for which there are quantified relationships with air quality include crop yields, improved human health, the public's willingness to pay for improved visibility, reduced damage to building materials, and reduced vehicle miles and vehicle hours traveled. Established concentration-response relationships and air quality data from different air quality models are used to assess the benefits. The second step involves qualitatively describing the remaining types of benefits that would result from implementing the draft Plan, but for which monetary benefit estimates are unavailable.

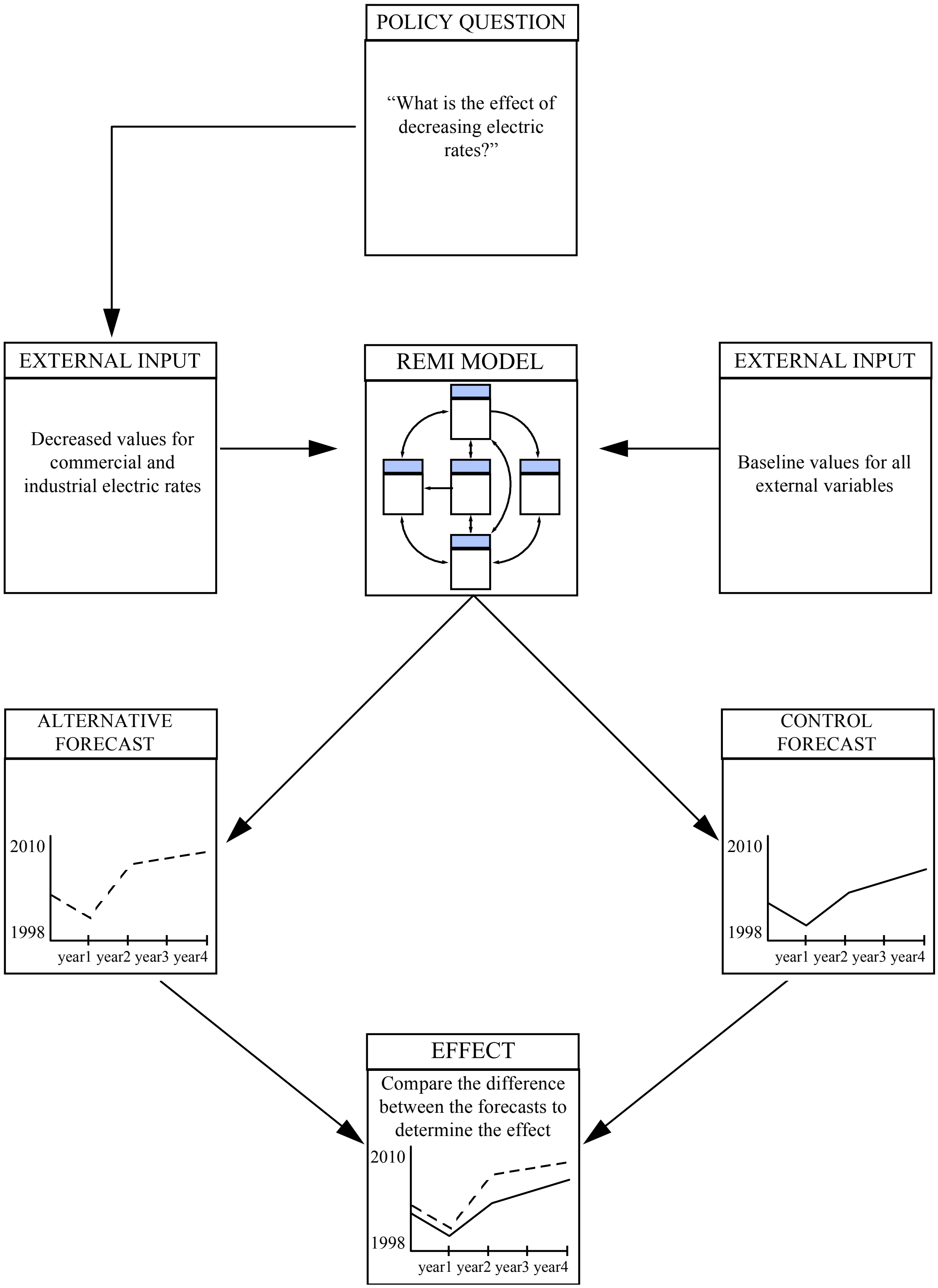
A two-step process is also employed to estimate the costs of the draft Plan. The first step involves the quantification of the draft Plan's impact based on those feasible measures for which cost estimates can be developed at this time. The discounted cash flow method is used to estimate the cost per ton of pollutant reduced for each control measure. The total cost of each control measure is also calculated. Based on the proportions of emission reductions, the total cost of each control measure is allocated to each sub-county region and SIC (Standard Industrial Classification) code. For stationary sources, facility emission reductions are aggregated by sub-region and SIC code according to the location of facilities. For area and mobile sources, emission reductions are assigned to air quality modeling grids. These emission reductions are then aggregated to 19 sub-regions according to the correspondence between grid cells and sub-regions. Population at census tracts from the 2000 census is used to split a grid that may be divided into more than one sub-region.

The second step involves the projection of control costs for those remaining long-term measures in the draft Plan. In this second step the average cost-effectiveness for quantified control measures is used as a surrogate cost for unquantified measures. That methodology is likely to over-predict costs if one considers the likelihood that costs will be on the decline as technology advances over the years. However, given the fact that only 30 percent of emission reductions can be quantified, this methodology could under-predict the cost of last few tons of emission reductions in the black box (the remaining 70 percent of emission reductions) needed for attainment. A sensitivity analysis is also provided to address this uncertainty.

To estimate job impacts and other socioeconomic impacts that may result from the quantifiable measures and clean air benefits, the REMI (Regional Economic Models, Inc.) 19-region 53-sector model is utilized. The REMI model incorporates state-of-the-art modeling techniques and the most recent economic data. The MIT report conducted on the AQMD's socioeconomic assessments found that the REMI model is "technically sound." Figure 1-4 shows an example of how the REMI model can be used to assess the socioeconomic impact of a policy. Both the cost and benefit impacts are developed outside of the REMI model and are used as inputs to the REMI model.

The REMI model cannot be employed to assess the impacts of the black box due to the lack of information on affected sources and control technology. Because of the relatively large size of the black box, the REMI model is used separately for the quantifiable control measures and clean air benefits. The assessment results from these two categories cannot be added because costs are associated with only 30 percent of emission reductions and clean air benefits are based on the air quality modeling results that used all the emission reductions for attainment demonstration.

Figure 1-4
Use of the REMI Model



To assess the impacts on socioeconomic groups, the impacts on product prices from the REMI model are overlaid on consumption patterns of various income groups to examine the changes in consumer price indexes of these income groups. The data on consumption patterns are from the Bureau of Labor Statistics' Consumer Expenditure Survey. Based on an extensive literature review and survey data on job displacement and re-employment rates of various ethnic groups, the ethnic distribution of the workforce in various industries is adjusted to account for differences in displacement by ethnic group.

To assess the impacts on competitiveness of the four-county area, the following were considered: the region's share of national jobs in those industries whose products are also sold in the national market, the impacts of the draft Plan on product prices and profits by industry, and the changes in imports and exports as a result of implementing the draft Plan's measures. These factors are selected based on a review of effects of past public policies on a region's competitiveness.

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CHAPTER 2

POPULATION AND ECONOMY OF THE FOUR-COUNTY REGION

Introduction
Population
Four-County Economy
Geographic Variation in Socioeconomic Trend

INTRODUCTION

Los Angeles, Orange, Riverside, and San Bernardino counties collectively constitute one of the largest regional economies in the United States. In 2003, the area's gross regional product (GRP) was $375.5 billion (1992 dollars), which was six percent of the nation's gross domestic product (REMI, 1999). These counties contained 16.1 million people in 2001, which was equivalent to 46 percent of California's total population (California Department of Finance, 2002) or six percent of the estimated U.S. population (U.S. Census Bureau, 2001). In addition, there were 6.5 million wage and salary workers in the four-county area in 2001, a 44 percent share of the state's total wage and salary workforce (California Department of Finance, 2002).

POPULATION

The population of the four-county area is expected to grow from its 1997 level of 14.9 million to 18 million in 2010 and 21.1 million in 2025 (SCAG, 2002b). This represents an annual population growth rate of 1.25 percent over the 2001 - 2025 period. Between 2010 and 2025 annual population growth will decrease slightly to an average of 1.1 percent.

According to the 2000 census, the 15.6 million residents in the four-county area had the following racial and ethnic distribution: 38 percent were White, 8 percent were African American, 40 percent were Hispanic, 11 percent were Asian or Pacific Islander, and 3 percent were of other races or multiple race. Los Angeles County was the most racially and ethnically diverse county in the region with 31 percent Whites and 45 percent Hispanics. Los Angeles and Orange counties had the highest percentage of Asians among the four counties and Orange and Riverside counties had the highest percentage of Whites. In all four counties, Whites and Hispanics were the two largest ethnic groups. Figure 2-1 shows the ethnic distribution of the population by county.

FOUR-COUNTY ECONOMY

The four-county economy is the tenth largest in the world, and is well diversified. The region has good growth prospects in foreign trade, professional services, tourism and entertainment, and high tech manufacturing (CCSCE, 2002a). The four-county region is well situated in proximity to Mexico and the Asian markets and is likely to continue as a leader in the entertainment industry. The four-county region has the nation's largest diversified manufacturing sector, which is transitioning away from heavy industry to design, fashion, and craft skills, driven by smaller, entrepreneurial firms. There is also an increased concentration of activities in science, biotech, and information technology.

From 1997 to 2000, job growth in the four-county region (1.2%) outpaced the nation (0.2%). In 2001 California began to experience an economic slowdown along with the nation. The four-county region experienced a less severe economic downturn than the nation or California, where job losses were most heavily concentrated in the San Francisco metropolitan area and Silicon Valley. Between 2001 and 2003, over 36,500 jobs were lost in the four-county region (CSSCE, 2003b). Los Angeles and Orange counties experienced job losses while the Inland Empire had a 5% job growth rate.

The region's ports and airports also had their trade volumes drop in 2001 during the current downturn. In 2001 there were 69 billion in exports and 143 billion in imports, representing a 6.3% decrease in exports and 9% decrease in imports from 2001.

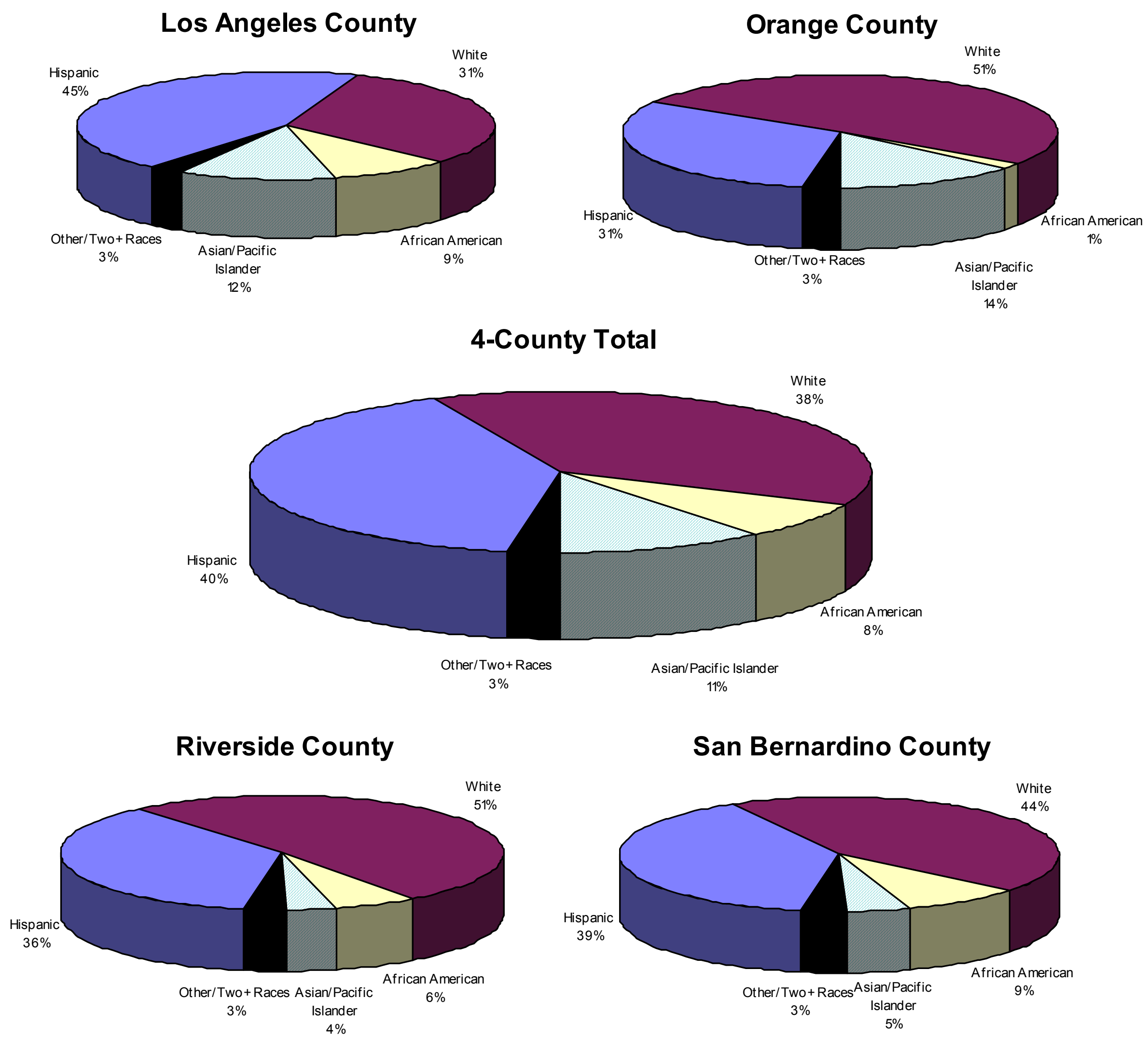


FIGURE 2-1

Population by Race and Ethnicity

Future Growth

Between 1997 and 2025, the four-county region is projected to increase by 2.81 million jobs or an annual growth rate of 1.3 percent (SCAG, 2002a). Total employment in Los Angeles County is projected to increase by 1 million jobs or an 0.8% annual growth rate while Orange County is projected to increase by 0.7 million jobs or a 2.2% annual growth rate. Similar to population growth, total employment in Riverside County is projected to increase by 0.55 million jobs or a 4.5% annual growth rate and San Bernardino County is projected to increase by 0.56 million jobs or a 3.8% annual growth rate.

Projections by the REMI (Regional Economic Models, Inc.) model indicate that from 1997 through 2020, almost 3 million new jobs are predicted for the four-county area, as shown in Figure 2-2 below. The REMI model's forecast has been adjusted to ensure consistency with SCAG's (Appendix C). This represents an estimated annual growth of approximately 1.4 percent.

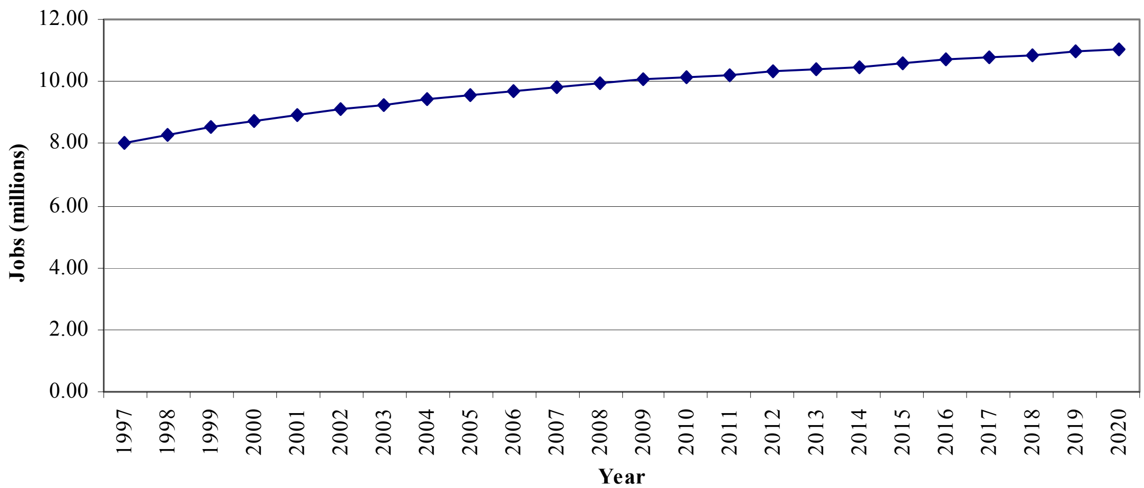


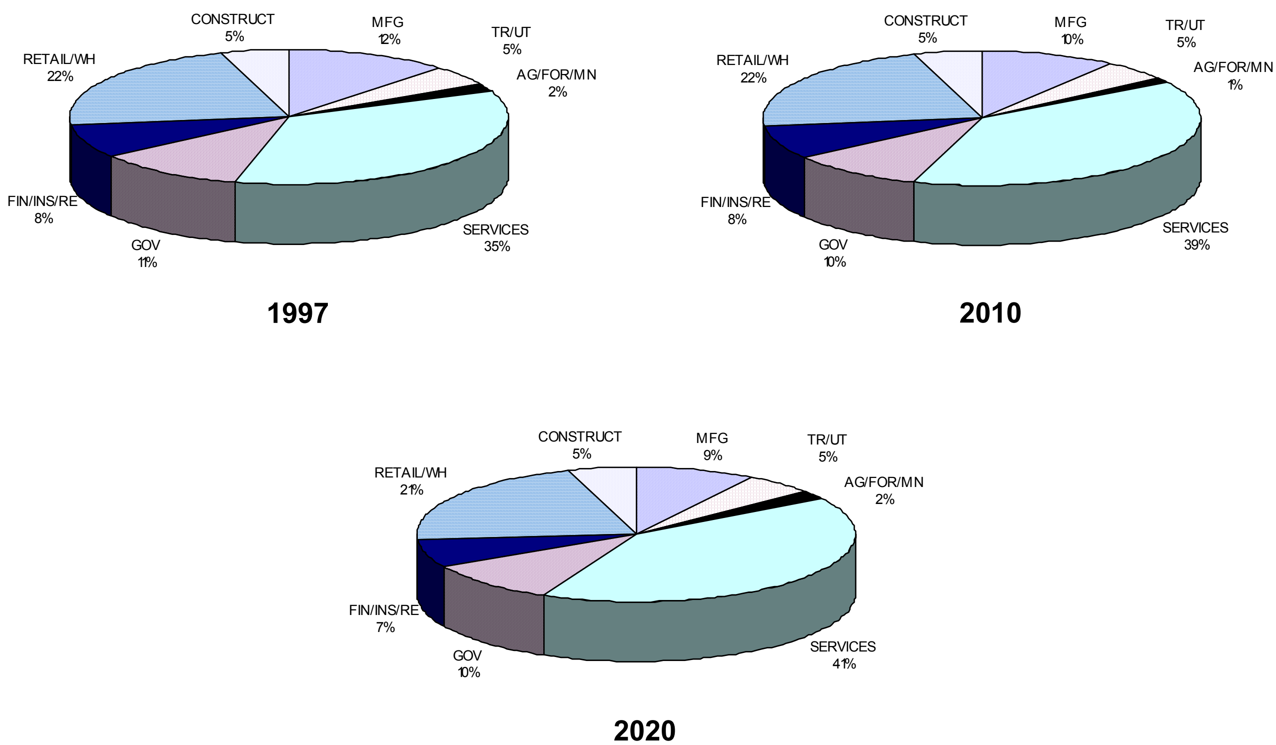
Figure 2-2

Projected Employment Growth in the Four-County Area

Projections for the 1997 AQMP predicted an increase of three million jobs for the four-county region between 1993 and 2010. This represents an annual growth rate of 2%, which was higher than the 1.79% rate of growth between 1993 and 2010 for the 2003 AQMP.

Figure 2-3 shows historical (1997) and projected employment in key sectors for 2010 and 2020. These sectors are represented by Standard Industrial Classification (SIC) codes. Employment in the manufacturing sector (SIC 20-39) is projected to decrease at an annual rate of 0.18 percent between 1997 and 2020. Employment in the service sector (SIC 70-89) is expected to grow by 2.7 percent per year over the entire period (1997-2020).

The service sector and the retail and wholesale trade sector (SIC 50-59) combined constituted over 57 percent of the region's employment in 1997. The four-county economy, which is composed of a large non-manufacturing sector, is becoming more service-based. As shown in Figure 2-3, the service sector is projected to increase its share of the region's employment from 35 percent in 1997 to 41 percent in 2020. The share of employment in retail and wholesale trade is expected to decrease slightly from 22 percent to 21 percent between 1997 and 2020. The government sector's (SIC 91-97) share of employment is projected to decrease slightly from 11 percent in 1997 to 10 percent in 2020. The manufacturing, transportation (SIC 41-47), and utilities (SIC 49) sectors' share of employment is projected to decline from its 17 percent share in 1997 to a 14 percent share in 2020.



AG/FOR/MN:	Agriculture, Forestry/Mining
CONSTRUCT:	Construction
FIN/INS/RE:	Finance, Insurance, Real Estate
MFG/TR/UT:	Manufacturing, Transportation, Utilities
RETAIL/WH:	Retail, Wholesale

FIGURE 2-3

Projected Employment by Sector in the Four-County Economy

The 8 percent share of employment of the finance, insurance, and real estate sector (SIC 60-67) in 1997 is expected to decrease slightly to 7 percent in 2020. The four-county area's gross regional product (GRP) is projected to increase from its 1997 level of $293 billion (in 1992 dollars) to $497 billion in 2020, which represents a 2.3 percent annual growth rate.

Historical Patterns

After recovery from the economic recession of 1990-1993, the region's total employment grew from 5.6 million employees in 1993 to 6.5 million employees in 2000, slightly faster than the nation (EDD, 2003). This is based on an analysis of 1990-2002 historical labor force data for wage and salary workers compiled by California's Employment Development Department (EDD). Beginning in 2002, EDD's sectoral designation is only available by the North American Industrial Classification System (NAICS) codes. Historical employment data by SIC will no longer be available beyond 2001. However, EDD has converted historical employment series from SIC to NAICS for the period of 1990 to 2001.

Los Angeles County experienced a sizeable gain in jobs—324,700 jobs from 1993 to 2002. Orange County gained 288,000 jobs between 1993 and 2002. San Bernardino and Riverside counties experienced a tremendous amount of growth with 322,900 new jobs between 1993 and 2002. Historical employment by county is shown below in Figure 2-4.

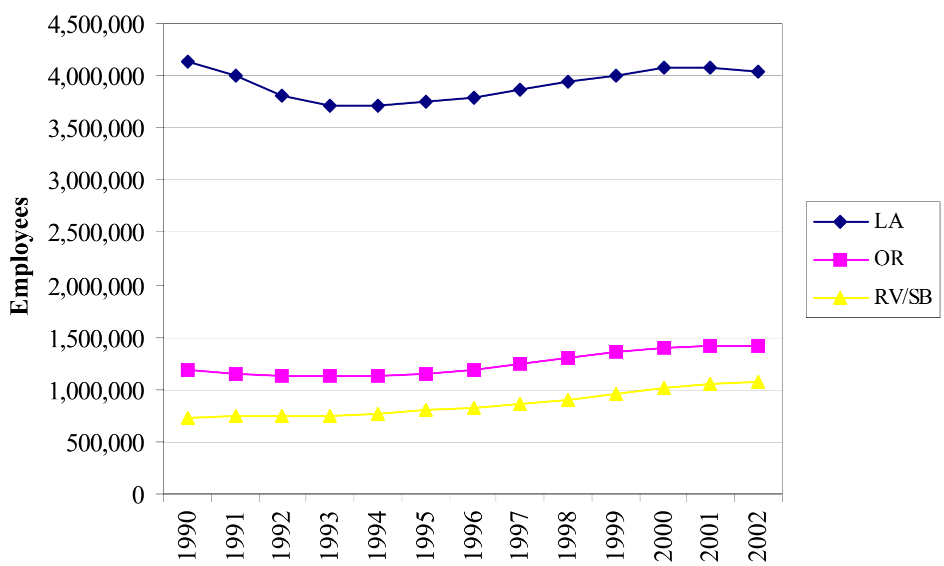


FIGURE 2-4

Historical Employment by County

The trend in Figure 2-5 shows the decline of the manufacturing sector (NAICS 31-33) after 1998 and the continual rise of the healthcare and social assistance sector (NAICS 62) which is referred to as Health in Figure 2-5. Between 1998 and 2002, the manufacturing sector lost 125,400 jobs in the four-county region. After the recession in 1994, the wholesale and retail trade sectors (NAICS 42, 44-45) gained 148,800 jobs between 1994 and 2002, making them two of the region's strongest sectors (these two sectors are combined and referred to as Wh/Retail in Figure 2-5). The professional and technical services sector (NAICS 54) had an even more dramatic upsurge in activity, gaining 204,300 jobs between 1993 and 2002 (this sector is referred to as Prof Srvs in Figure 2-5). The arts, entertainment and recreation sector (NAICS 71) and the accommodation and food services sector (NAICS 72) showed more moderate growth with an increase of 102,700 jobs between 1995 and 2002 (these two sectors are combined and referred to as Leisure in Figure 2-5). A similar moderate growth pattern is also exhibited by the healthcare and social assistance sector (NAICS 62) with an additional 62,100 jobs between 1998 and 2002. The finance and insurance sector (NAICS 52) declined throughout the 1990s and has only begun to experience a small amount of job growth, with an increase of 27,300 jobs between 2000 and 2002 (this sector is referred to as Finance in Figure 2-5). The information sector (NAICS 51) that includes the majority of the motion picture as well as printing and publishing industries experienced a gradual spurt of growth from 1994 to 2000, gaining an additional 78,500 jobs before losing 38,200 jobs from 2000 to 2002 (this sector is referred to as Info in Figure 2-5).

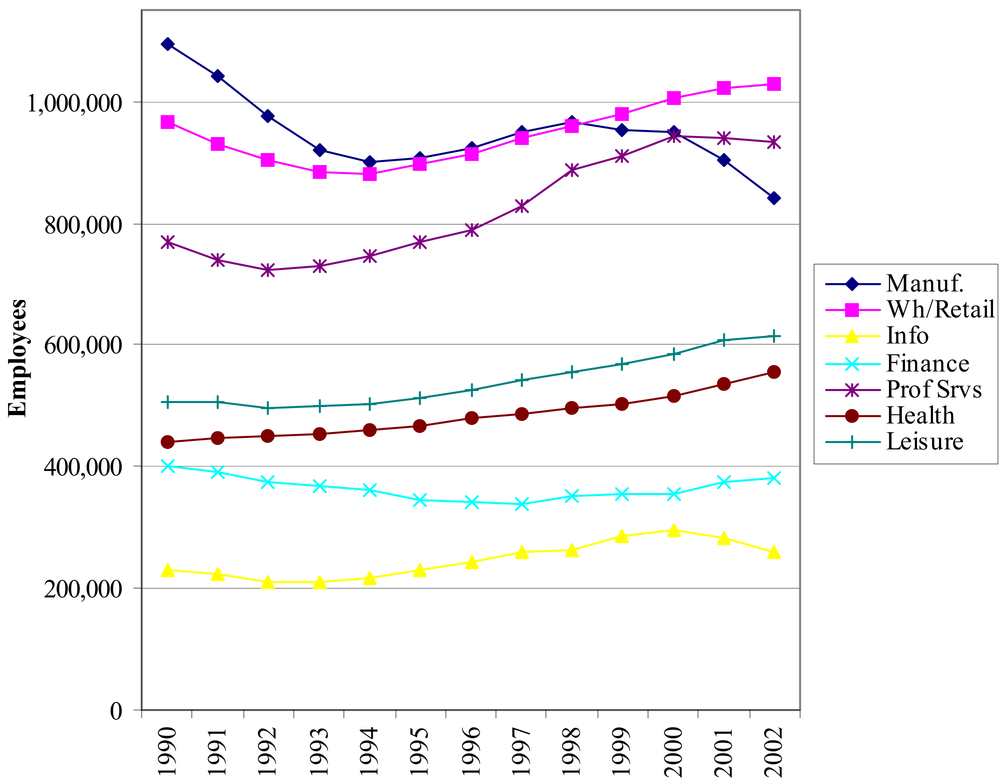


FIGURE 2-5

Historical Employment by Industry

Ethnic Distribution of the Workforce

Data from the 1990 Census also provides an insight into the ethnic composition of the workforce by major industry and by occupational category. Data from the 2000 Census which would have provided an update to the 1990 census has not been released to the public yet.[1] Table 2-1 shows the workforce's ethnic composition in the four-county area in 2000 for 11 major economic sectors. Knowing the ethnic makeup of the workforce in various industries is important in assessing the potential impact of the 2003 AQMP on ethnic groups. Sectors with the highest proportion of Whites were mining; finance, insurance, and real estate; and services. African Americans were represented more frequently in the government; transportation, communications, and utilities; and service sectors. The sectors where Asians and Pacific Islanders were represented in the highest proportions were finance, insurance, and real estate; and wholesale and retail trade. Hispanics were found in the highest proportions among the agricultural, non-durable goods manufacturing, and construction sectors.

TABLE 2-1

Ethnic Composition of the Four-County Workforce
by Major Sector

Industry	Percentage					Employment (in thousands)
	White	African American	Asian	Hispanic	Other	
Agriculture	30.6	2.5	6.3	60.3	0.4	106
Mining	66.8	7.2	3.6	21.6	0.9	10
Construction	56.5	3.5	4.2	35.2	0.7	432
Nondurable Manufacturing	37.2	4.0	9.1	49.2	0.5	413
Durable Manufacturing	49.5	5.4	9.4	35.1	0.6	854
Transportation & Public Utilities	54.1	12.7	8.2	24.0	0.9	426
Wholesale Trade	55.5	4.3	10.9	28.7	0.6	320
Retail Trade	51.0	5.0	10.8	32.6	0.6	1017
Finance, Insur., Real Est.	65.6	7.1	11.0	15.9	0.5	508
Services	58.2	8.3	9.4	23.5	0.6	2118
Government	56.4	16.0	7.8	19.0	0.8	210
Total	54.1	6.9	9.3	29.1	0.6	6414

GEOGRAPHIC VARIATION IN SOCIOECONOMIC TREND

Based on census tract boundaries with consideration of topographical features and city boundaries, the four-county area was divided into nineteen sub-regions. The counties of Riverside and San Bernardino were divided into two sub-regions each: the more urbanized

[1] 2000 Census PUMS 1% data was scheduled to be released in April 2003 and hence is unavailable for this analysis.

western portions and the more sparsely populated eastern areas. Los Angeles County was divided into eleven sub-regions and Orange County was divided into four sub-regions. Figures 2-6 and 2-7 shows the ethnic distribution of population in 1990 and 2000 in each of these sub-regions, respectively.

Socioeconomic characteristics on the sub-regions were compiled using 1990 and 2000 Census data. These data were aggregated to the sub-region level by apportioning census tracts to the appropriate sub-region. Spatial allocation of census tracts were assigned to sub-regions using ArcGIS. The nineteen sub-regions showed considerable variation as measured by several socioeconomic indices (Table 2-2). The less populated sub-regions of Riverside and San Bernardino Counties had significant increases in population between 1990 and 2000. The relative presence of minorities in each area ranged from a low of 31 percent in the southern part of Orange County to 98 percent in the south central area of Los Angeles County according to the 2000 census. Minority population increased in all sub-regions between 1990 and 2000 but increased most dramatically in the less populated sub-regions of Riverside and San Bernardino Counties. The percentages of youth and elderly are fairly uniform throughout the sub-regions with the exception of a slightly lower percentage of youth in the western area of Los Angeles County. The percentage of youth increased in all sub-regions between 1990 and 2000 with the greatest increase in the beach and northern sub-regions of Los Angeles County. The northern and western sub-regions of Orange County had the greatest increase in elderly population. The poverty rates ranged from a low of 6% in the southern part of Orange County to 33% in the south central area of Los Angeles County according to the 2000 census. The poverty rate increased in all sub-regions between 1990 and 2000, increasing the most in the northern sub-region of Los Angeles County and less populated sub-region of San Bernardino County.

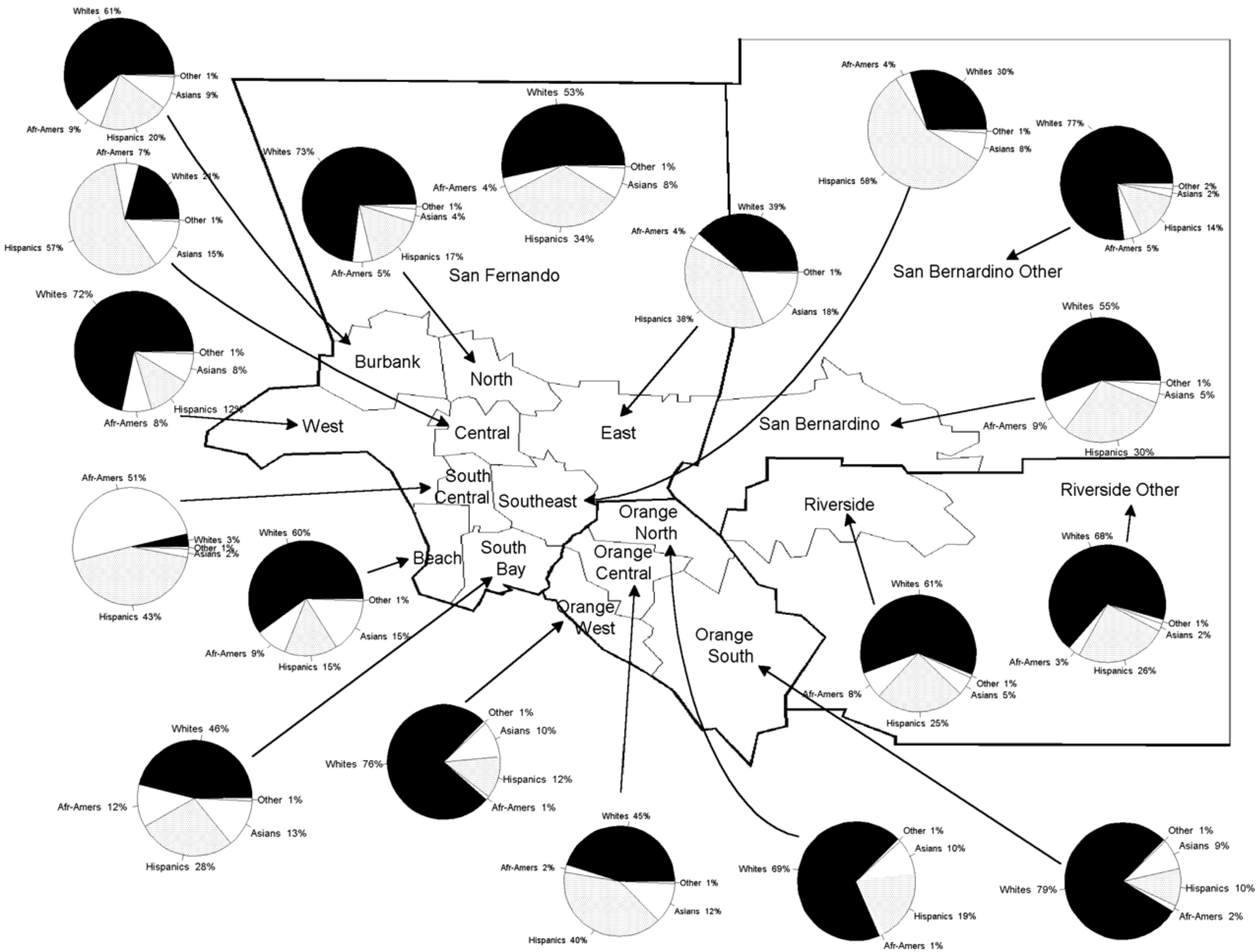


FIGURE 2-6
1990 Census: Ethnic Distribution of Population

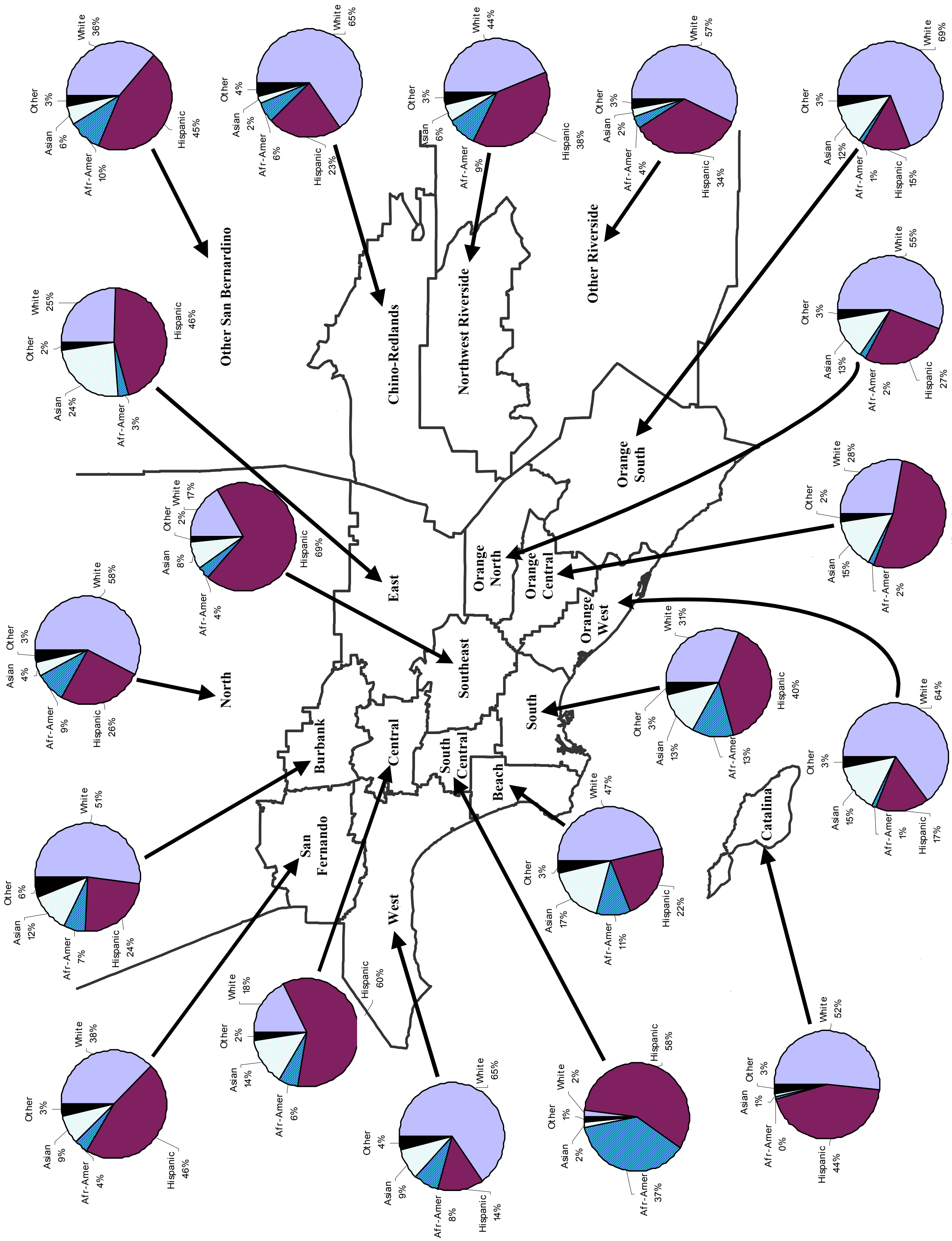


FIGURE 2-7

2000 Census: Ethnic Distribution of Population

TABLE 2-2
Comparison of Socioeconomic Characteristics of County Sub-areas in 1990 and 2000

Subarea	Population (thousands)		Percent (%)							
			Minority[1]		Poverty[2]		Youth[3]		Elderly[4]	
	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
LA Burbank	541	569	39%	48%	12%	13%	22%	24%	13%	13%
LA San Fernando	1,107	1,239	47%	62%	11%	16%	25%	28%	10%	10%
LA West	792	825	28%	35%	9%	11%	15%	17%	14%	13%
LA Central	1,212	1,230	79%	82%	23%	27%	26%	26%	9%	9%
LA South Central	950	980	97%	98%	29%	33%	34%	36%	8%	7%
LA South	797	856	54%	69%	14%	19%	26%	29%	10%	10%
LA East	1,473	1,576	61%	75%	11%	14%	28%	28%	9%	10%
LA Southeast	1,068	1,170	70%	83%	14%	16%	31%	32%	9%	8%
LA Island	3	4	N.A.[5]	48%	N.A.	11%	N.A.	30%	N.A.	9%
LA Beach	526	560	40%	53%	7%	10%	21%	25%	10%	11%
LA North	163	508	24%	43%	4%	12%	27%	32%	6%	7%
Orange North	352	401	31%	44%	7%	9%	25%	27%	8%	10%
Orange Central	869	1,010	55%	72%	13%	16%	27%	31%	8%	8%
Orange South	587	784	21%	31%	5%	6%	24%	26%	10%	10%
Orange West	602	648	24%	36%	6%	8%	21%	23%	10%	12%
Northwest Riverside	553	661	39%	56%	10%	14%	31%	33%	7%	7%
Other Riverside	328	877	23%	43%	10%	15%	27%	29%	20%	17%
Chino-Redlands	1,050	1,260	45%	64%	12%	16%	31%	33%	8%	7%
Other San Bernardino	45	447	11%	35%	8%	15%	27%	30%	13%	12%
South Coast Air Basin	13,018	15,605	50%	62%	13%	16%	26%	29%	10%	10%

[1]Percentage of Minority is defined as anyone but non-Hispanic White in a single race designation divided by the total population.
[2]Poverty levels vary by family size. For the 1990 Census, the federal poverty level for a family of four is $12,674. For the 2000 Census, the federal poverty level for a family of four is $17,050.
[3]Youth = 18 years old or younger
[4]Elderly = 65 years old or above
[5]N.A. = Not Available

CHAPTER 4

EMPLOYMENT IMPACTS

Introduction

Job Impacts from Quantified Measures and Benefits

Projected Job Impacts from Unquantified Measures

Summary

INTRODUCTION

The employment impacts of quantified control measures and clean air benefit were performed by utilizing the Regional Economic Model, Inc. (REMI) model. This model contains 19 sub-regions within the four-county area. Each sub-region is comprised of 53 public and private sectors. The structure of each sub-region's economy is represented through production, sales, and purchases between sectors; demand for and supply of products in each sector; expenditures made by consumers, businesses, and governments; and product flows between one sub-region, the rest of sub-regions, and the rest of U.S.

The employment impact analysis was performed separately for quantified control measures and clean air benefits since quantified control measures represent only 30 percent of the total emission reductions required for meeting the air quality standards and quantification of benefits includes all the intended emission reductions. The employment impacts in this chapter represent deviations from the baseline regional job growth line illustrated in Figure 2-2.

Alternatively, an employment impact analysis could be performed for the quantified measures (representing 30 percent of the total emission reductions only) and their corresponding air quality benefits. However, these measures are not expected to bring the Basin into the attainment of the air quality standards. The resulting employment analysis would thus not be meaningful.

JOB IMPACTS FROM QUANTIFIED MEASURES AND BENEFITS

Implementation of the draft 2003 AQMP will improve visibility, decrease expenditures on household cleaning and on refurbishing building surfaces and replacing tires, reduce morbidity and mortality, reduce congestion, and increase crop yields, as discussed in Chapter 3. The quantifiable total annual benefit for measures proposed in the draft 2003 AQMP amounts to approximately $9 billion in 2010. The quantified measures which represent 30 percent of the emission reductions intended for attainment will result in an annual cost of approximately $1.9 billion in 2010. Both benefits and costs will affect the employment base in the four-county economy.

The four-county economy will expand from the effects of two major forces resulting from cleaner air. First, the substitution of imports [general consumer purchases (which would increase due to the reduction in health care expenditures)] for local production (reduced health care services related to improved air quality) leads to jobs not created.[1] Second, the improvement in the quality of life will make the area more attractive so that more people will move in until the expected real earnings rate is reduced enough to compensate for the estimated effect of the increased amenities. This influx will increase the labor force and increase local demand. On the other hand, the local economy will also experience relative slowdown from implementing control measures. This is because the increased cost of doing business leads to fewer jobs created due to the location effect and to the higher costs that reduce consumer

[1] General consumer purchases can be satisfied by local production and imports. Health care services are locally produced goods.

purchasing power. Table 4-1 shows the average annual job impacts as well as impacts with respect to the years 2010 and 2020 for quantified control measures and benefits, respectively.

TABLE 4-1

Job Impacts of Quantified Clean Air Benefits and Measures

Category	2010	2020	Average Annual
Quantified Benefits	33,280	60,570	33,372
Congestion Relief	29,670	45,790	27,521
Visibility Improvements	2,400	9,040	4,252
Reduced Materials Expenditures	1,044	1,675	1,084
Health Benefits	-430	3,488	1,211
Increased Crop Yields	582	474	517
Quantified Control Measures	10,220	-22,190	-10,523
AQMD	-3,854	-5,050	-3,421
CARB & U.S. EPA	-9,025	-12,210	-7,565
SCAG	23,070	-5,046	-171

Results from modeling all the categories are slightly different from the sum of results from modeling each category one at a time because of nonlinearity of the REMI model.

The job impact of air quality benefits is assessed separately for each benefit category: visibility improvements, increased crop yields, health benefits, reduced congestion, and reduced expenditures on materials. Many of the benefits of improved air quality can be seen as both direct and indirect benefits to individuals living in the area. For example, reductions in out-of-pocket health expenditures are used as a proxy for the quality-of-life value of morbidity benefits (i.e., reduced illness). Due to improved air quality the growth of health-related occupations may decrease as health expenditure decreases. Nevertheless, a net gain of approximately 1,211 more jobs annually from the increased attractiveness of the area is still projected. Moreover, decreased congestion could create an additional 27,521 jobs. Together, the quantified benefits could result in an average of 33,372 jobs created annually.

The total projected employment without the AQMP in 2010 is 10.1 million jobs. The quantifiable control measures will result in an average of 10,523 jobs forgone annually, on average, over the period from 2002 to 2020. The 218 transportation projects alone are projected to result in 3,763 jobs created from constructing and maintaining highway and transit (bus and rail) infrastructure. These projects will be funded through local revenue sources and the out-of-area funding sources (state and federal governments). However, it should be noted that the costs of these infrastructure projects will continue to be paid for long after these projects are completed. The remaining control measures are projected to result in jobs forgone.

Job Impacts by Industry

Table 4-2 shows the average annual job impact by industry between 2002 and 2020 and with respect to the years 2010 and 2020 for quantified clean air benefits and measures separately. In total, cleaner air would result in creation of 33,372 jobs annually, on average, from 2002 to 2020 which is approximately 0.33 percent of the baseline jobs during the same period. The sectors that are projected to have the relatively large share of jobs created are retail trade (SICs 52-59), miscellaneous business services (SIC 73), and governments. As the area becomes more attractive due to cleaner air, more people will move in and thus demand more services from governments. The jobs forgone in the health services sector (SIC 80) are due to the reduced health related expenditures to the medical sector as a result of improved air quality.

Implementation of quantified measures would, on the other hand, result in jobs foregone. At the sectoral level, manufacturers of transportation equipment (SICs 372-379) and the sectors of construction and auto repairs (SIC 75) are projected to experience additional jobs created. A number of on- and off-road measures would stimulate additional demand for transportation equipment and auto services and thus benefiting the sectors producing these goods. The heavy infrastructure investment resulting from the 218 transportation projects would certainly benefit the construction industry. While investments in roadway technology and other infrastructure made by the government sector benfit a number of other sectors, the government sector itself is projected to experience jobs forgone due to the reduced spending elsewhere in order to compensate for the increase in investments. The sectors of retail trade and miscellaneous business services are projected to have relatively large share of jobs forgone mainly due to the reduction in personal income resulting from the overall jobs forgone in the economy.

TABLE 4-2
Draft 2003 AQMP Employment Impacts by Industry
for Quantified Clean Air Benefits and Measures

	Benefit						Cost					
	2010		2020		Average Annual (2002-2020)		2010		2020		Average Annual (2002-2020)	
Industry (SIC)	Jobs	% Baseline	Jobs	% Baseline	Jobs	% Baseline	Jobs	% Baseline	Jobs	% Baseline	Jobs	% Baseline
Lumber (24)	165	0.63	302	1.03	165	0.61	6	0.02	-91	-0.31	-49	-0.18
Furniture (25)	241	0.46	450	0.67	245	0.43	-188	-0.36	-320	-0.47	-219	-0.38
Stone, Clay, etc. (32)	146	0.60	238	0.96	139	0.56	159	0.66	140	0.56	60	0.24
Primary Metals (33)	123	0.51	252	0.93	133	0.52	-13	-0.06	-89	-0.33	-45	-0.18
Fabricated Metal (34)	329	0.39	653	0.66	347	0.39	18	0.02	-234	-0.24	-110	-0.12
Industrial Machinery & Equipment (35)	221	0.28	326	0.36	196	0.25	-134	-0.17	-187	-0.21	-171	-0.21
Elect. Equipment (36)	222	0.25	341	0.42	207	0.24	-72	-0.08	596	0.74	188	0.22
Motor Veh. (371)	45	0.22	110	0.50	54	0.25	-11	-0.05	-30	-0.14	-23	-0.11
Rest of Transp. Equip. (372-379)	161	0.15	319	0.28	170	0.15	9854	8.97	997	0.88	3756	3.39
Instruments (38)	200	0.24	350	0.41	201	0.23	-294	-0.36	-268	-0.31	-233	-0.27
Misc. Manuf. (39)	165	0.43	275	0.80	161	0.43	-128	-0.34	-178	-0.52	-116	-0.31
Food (20)	323	0.55	493	0.86	297	0.50	-169	-0.29	-252	-0.44	-158	-0.27
Tobacco Manuf. (21)	0	-0.01	0	0.00	0	0.00	0	-0.01	0	0.00	0	0.00
Textiles (22)	109	0.59	181	1.01	106	0.55	-88	-0.47	-124	-0.69	-80	-0.41
Apparel (23)	253	0.33	315	0.60	218	0.28	-264	-0.34	-309	-0.59	-212	-0.27
Paper (26)	136	0.63	274	1.16	145	0.65	-131	-0.60	-167	-0.70	-115	-0.51
Printing (27)	260	0.32	512	0.57	273	0.32	-131	-0.16	-308	-0.34	-174	-0.20

TABLE 4-2
(Continued)

	Benefit						Cost					
	2010		2020		Average Annual (2002-2020)		2010		2020		Average Annual (2002-2020)	
Industry (SIC)	Jobs	% Baseline	Jobs	% Baseline	Jobs	% Baseline	Jobs	% Baseline	Jobs	% Baseline	Jobs	% Baseline
Chemicals (28)	260	0.68	485	1.33	270	0.71	120	0.31	173	0.47	85	0.22
Petroleum Products (29)	37	0.67	52	1.12	34	0.60	-153	-2.72	-233	-4.97	-157	-2.77
Rubber (30)	198	0.37	395	0.75	214	0.40	-187	-0.35	-192	-0.37	-145	-0.27
Leather (31)	24	0.68	32	1.18	21	0.60	-25	-0.72	-29	-1.08	-19	-0.55
Mining (10,12-14)	19	0.27	24	0.38	17	0.22	-32	-0.45	-45	-0.70	-36	-0.48
Construction (15-17)	3386	0.66	4398	0.79	2855	0.57	9782	1.92	9799	1.77	5121	1.02
Railroad (40)	11	0.21	18	0.40	11	0.20	20	0.39	-24	-0.53	-4	-0.07
Trucking (42)	659	0.49	2848	2.16	1211	0.92	-282	-0.21	-527	-0.40	-354	-0.27
Local/Interurban (41)	186	0.43	380	0.70	194	0.44	-114	-0.26	-390	-0.72	-171	-0.39
Air Transp. (45)	225	0.27	361	0.44	211	0.26	-191	-0.23	-469	-0.57	-234	-0.28
Other Transp. (44,46-47)	155	0.19	451	0.43	201	0.24	-678	-0.84	-4021	-3.87	-1390	-1.65
Communication (48)	407	0.37	551	0.51	352	0.33	-181	-0.16	-250	-0.23	-188	-0.17
Public Utilities (49)	186	0.46	371	0.69	192	0.45	-49	-0.12	-141	-0.26	-125	-0.29
Banking (60)	686	0.49	940	0.73	602	0.44	-222	-0.16	-393	-0.31	-259	-0.19
Insurance (63,64)	486	0.28	1022	0.48	531	0.30	-234	-0.14	-650	-0.31	-323	-0.18
Credit & Finance (61-62,67)	799	0.39	1169	0.61	718	0.36	-300	-0.15	-522	-0.27	-340	-0.17
Real Estate (65)	425	0.14	534	0.17	351	0.12	45	0.02	72	0.02	-19	-0.01
Eating & Drinking (58)	2903	0.54	4502	0.74	2633	0.48	-371	-0.07	-1347	-0.22	-752	-0.14
Rest of Retail (52-57,59)	4033	0.39	6476	0.61	3769	0.37	-2674	-0.26	-7097	-0.67	-3945	-0.38
Wholesale (50-51)	1513	0.27	2548	0.44	1442	0.26	-1689	-0.30	-3689	-0.64	-2360	-0.42
Hotels (70)	424	0.39	1013	0.74	487	0.43	-382	-0.35	-454	-0.33	-310	-0.27
Personal Serv. & Repair (72,76)	971	0.36	1634	0.53	925	0.33	-249	-0.09	-711	-0.23	-426	-0.15
Private Household (88)	308	0.37	425	0.50	271	0.31	-107	-0.13	-142	-0.17	-89	-0.10
Auto Repair/Serv. (75)	563	0.36	1161	0.63	594	0.38	2349	1.52	488	0.26	634	0.41
Misc. Busi. Serv. (73)	3363	0.30	6253	0.50	3384	0.31	-1799	-0.16	-3711	-0.30	-2508	-0.23
Amuse. & Recreation (79)	903	0.40	1280	0.54	792	0.35	-338	-0.15	-523	-0.22	-339	-0.15
Motion Pictures (78)	203	0.10	310	0.19	190	0.10	-217	-0.11	-157	-0.09	-151	-0.08
Medical (80)	-1444	-0.20	-412	-0.05	-600	-0.08	223	0.03	556	0.06	250	0.03
Misc. Prof. Serv. (81,87,89)	2191	0.35	3982	0.53	2182	0.34	130	0.02	-821	-0.11	-807	-0.13
Education (82)	927	0.48	1119	0.55	757	0.39	-327	-0.17	-271	-0.13	-219	-0.11
Non-Profit Org. (83-84,86)	1386	0.53	2072	0.71	1238	0.47	-437	-0.17	-897	-0.31	-516	-0.20
Agri/Forest/Fish Serv. (07-09)	434	0.32	835	0.50	431	0.31	-313	-0.23	-954	-0.57	-468	-0.34
Government (91-97)	3073	0.28	7686	0.66	3679	0.34	690	0.06	-3791	-0.32	-2262	-0.21
Farm (01-02)	277	1.01	267	1.08	158	0.58	0	0.00	0	0.00	0	0.00
Total	33280	0.33	60570	0.55	33372	0.33	10220	0.10	-22190	-0.20	-10523	-0.10

Small Business Effects

The AQMD defines a "small business" in Rule 102 as one which employs 10 or fewer persons and which earns less than $500,000 in gross annual receipts. In addition to the AQMD's definition of a small business, the federal Small Business Administration (SBA), the federal Clean Air Act Amendments of 1990 (CAAA), and the California Department of Health Services (DHS) also provide their own definitions of a small business. Two common characteristics of the SBA, CAAA, and DHS small business definitions are the following: (1) standards are unique to each industry type, and (2) the businesses have to be independently owned and operated, and cannot be dominant in their field.

The SBA's definition of a small business uses the criterion of either gross annual receipts (ranging from $0.5 million to $17 million, depending on industry type) or number of employees (ranging from 100 to 1,500). The CAAA classifies a facility as a "small business stationary source" if it (1) employs 100 or fewer employees, (2) does not emit more than 10 tons per year of either ROG or NO_X, and (3) is a small business as defined by SBA. The DHS definition of a small business uses an annual gross receipt criterion (ranging from $1 million to $9.5 million, depending on industry type) for non-manufacturing industries and an employment criterion of fewer than 250 employees for manufacturing industries.

Under the SBA's and CAAA's definitions of small business, the AQMP could potentially impact a wide range of small businesses. The number of affected small businesses will be fewer under the AQMD's definition. Small businesses are more highly concentrated in non-manufacturing than manufacturing sectors. Since the affected businesses are not exactly known at this stage, additional analyses of the number and types of small businesses affected by each control measure will be performed during the individual rule development processes.

SUMMARY

Without the AQMP, jobs in the four-county area are projected to grow at an annual rate of about 1.069 percent between 2002 and 2020. Cleaner air would bring the job growth rate to an annual rate of 1.098 percent. On the other hand, the quantified measures would slow down the job growth rate to 1.053 percent. The four-county region is projected to have 11 million jobs in 2020. The jobs created from quantified clean air benefits would amount to 0.55 percent of the 2020 baseline jobs. The jobs forgone from quantified measures would be 0.2 percent of the 2020 baseline jobs.

The medical sector would experience jobs forgone due to reductions in illness from cleaner air. The industries of construction and auto repair services and manufacturers of transportation equipment would experience additional jobs created due to additional demand for their products as required by on- and off-road control measures.

The small business impact of individual control measures will be examined in the rule development process. The employment impact associated with unquantified measures will be examined further as costs of these measures are developed. In addition, as these measures are developed into rules, their potential employment impacts will be specifically assessed. Chapter 8 has a more detailed description of these future assessments.

CHAPTER 5

IMPACTS ON ETHNIC AND ECONOMIC GROUPS AND COMMUNITIES

Introduction
Clean Air Benefit by Sub-region
Costs by Sub-region
Job Impacts by Sub-region
Job Impacts by Race and Ethnicity
Job Impacts on High- Versus Low-Paying Jobs
Impacts on Disposable Income
Impacts on Price Index by Income
Summary

INTRODUCTION

Socioeconomic issues have become increasingly important in recent years during the development of air quality regulations and policies. Evaluation of the distribution of job and cost impacts among ethnic and economic groups as well as geographic communities is a key topic to be considered.

While a socioeconomic assessment provides valuable information regarding the potential direct and secondary effects, the analysis does have some limitations. Establishing appropriate methods to estimate distribution effects is difficult because the socioeconomic assessment in the air pollution area is a relatively new field. Few analytical models exist that can be easily adapted to air quality policy analysis. Moreover, there is an inherent bias because costs tend to be more easily measured than benefits. Finally, there are additional uncertainties associated with examining subpopulations within the four-county area. Overall, socioeconomic assessments require substantially more data than what currently exists because existing data are often limited or based on small samples, thereby making estimates less reliable.

It is not possible at this time to quantify the costs associated with every control measure or the benefits associated with every effect of clean air. Of the 40 control measures considered for emission reductions, 36 have quantifiable costs. Costs for the other measures are not available at this time because specific source categories, control efficiencies, emission reductions, or costs of control technologies are not presently known. The measures whose costs cannot be quantified command 70 percent of the total emission reductions intended for the attainment.

The REMI model, used to analyze potential impacts of the draft 2003 AQMP, projects possible impacts on jobs, the distribution of jobs, income, and product prices based upon the input of cost data for the quantified control measures and benefit data for each quantified effect of clean air. The reliability of such projections is dependent upon the validity of the input. The AQMD staff believes that it would be inappropriate to make assumptions relative to job impacts on ethnic groups for unquantified measures and benefits. The analysis contained herein, therefore, considers only those measures and benefits for which quantification is available. Furthermore, the job and other socioeconomic impacts from control measures and clean air are presented separately due to the relatively large size of emission reductions from unquantified measures. These impacts should not be summed since the clean air benefits were based on all the emission reductions intended for the attainment.

CLEAN AIR BENEFITS BY SUB-REGION

The four-county area is projected to attain the federal PM10 standard in 2006 and the federal ozone standard in 2010. Air quality benefits occur throughout the Basin. The quantified health benefits from reductions in PM10 and ozone are expected to reach $2.2 billion in 2010 and $1.9 billion annually, on average, from 2005 to 2020. When compared with the baseline "no control" scenario, the Chino-Redlands area shows the greatest reduction in PM10 and ozone concentration and hence the greatest health benefit. Seventy-five percent of the agricultural benefit congregates in the non-urbanized Riverside County (Table 5-1). The majority of the congestion relief benefit would be attributed to the east portion (the San Gabriel Valley) of Los Angeles County and the Chino-Redlands area. The east and west portions of Los Angeles County would also have the highest share of the visibility aesthetic benefit. Despite that visibility in Inland Empire is projected to improve the most relative to all other sub-regions, the willingness to pay for visibility improvement is higher in the sub-regions with denser population due to their higher net household income (net of housing cost) and percentage of college degree holders, which are also factors in determining the willingness to pay.

The health and agricultural benefits were calculated at the 5 kilometer by 5 kilometer grid level and aggregated to the 19 sub-region level using the air quality projections from the Urban Airshed Model and the PM10 model. The visibility benefit analysis was performed at the 19 sub-region level by aggregating the predicted PM10 concentration data for each grid and the total light extinction coefficient at the nearest airport for each grid to 19 sub-regions. The congestion relief benefit was assessed by aggregating the reductions in VMT and VHT at the air quality grid level to 19 sub-regions. The assessment of material benefit was performed at the county level and allocated to sub-regions according to their population and housing units within a county. All the assessments were first made for the benchmark years (2010 for ozone and 2006 and 2010 for PM10) in the air quality models and interpolated for interim years. The 2020 benchmark year for both pollutants was created by assuming that the performance in 2010 as a result of the draft 2003 AQMP would continue in 2020.

TABLE 5-1

Average Annual Benefits (2002-2020) by Sub-region

	Health		Agriculture		Congestion Relief		Material		Visibility		Total	
Sub-region	MM $	%	MM $	%	MM $	%	MM $	%	MM $	%	MM $	%
LA CO Burbank	89	5%	0.0	0%	45	3%	3	4%	232	6%	369	5%
LA CO San Fernando	137	7%	0.0	0%	103	7%	5	8%	251	6%	497	7%
LA CO West	36	2%	0.0	0%	94	6%	5	7%	505	13%	640	9%
LA CO Central	143	7%	0.0	0%	101	7%	6	8%	265	7%	514	7%
LA CO South Central	115	6%	0.0	0%	58	4%	4	5%	63	2%	240	3%
LA CO South	92	5%	0.0	0%	82	6%	4	6%	168	4%	345	5%
LA CO East	181	9%	0.1	0%	153	11%	6	9%	372	10%	712	10%
LA CO Southeast	124	6%	0.0	0%	97	7%	4	6%	134	3%	359	5%
LA CO Island	0	0%	0.0	0%	0	0%	0	0%	1	0%	1	0%
LA CO Beach	58	3%	0.2	1%	43	3%	3	4%	205	5%	310	4%
LA CO North	34	2%	0.0	0%	51	4%	2	3%	126	3%	213	3%
ORANGE CO North	57	3%	0.1	1%	48	3%	2	3%	103	3%	210	3%
ORANGE CO Central	169	9%	0.1	0%	95	7%	4	5%	112	3%	380	5%
ORANGE CO South	116	6%	2.1	11%	104	7%	4	6%	305	8%	531	7%
ORANGE CO West	77	4%	0.5	3%	60	4%	3	5%	220	6%	361	5%
Northwest Riverside	157	8%	0.7	4%	84	6%	3	5%	140	4%	385	5%
Other Riverside	76	4%	14.2	75%	88	6%	5	7%	294	8%	478	6%
Chino-Redlands	218	11%	0.5	3%	135	9%	4	6%	287	7%	646	9%
Other San Bernardino	46	2%	0.4	2%	11	1%	2	2%	123	3%	182	2%

Total	**1,925**	100%	**18.9**	100%	**1,450**	100%	**70**	100%	**3906**	100%	**7,374**	100%

COSTS BY SUB-REGION

The draft 2003 AQMP requires emission reductions from stationary, area, on-road, and off-road sources. Emission reductions from stationary sources consist of those from permitted (point) and non-permitted (area) sources. Projected emission reductions in 2010 from area sources were assigned to a 5 kilometer by 5 kilometer grid and those from point sources were assigned to a census tract for each quantified measure. The emission reductions for each quantified measure in each grid or census tract were then aggregated to a total of 19 sub-regions. The annual cost for each quantified measure (annualized capital and annual operating and maintenance expenditures) during the implementation period was then allocated to each sub-region according to its proportion of emission reductions.

Costs of SCAG transportation control measures will be financed by private and public funding. The private funding was allocated to the designated sectors according to the location of projects. The public funding was first allocated to each county according to the tax burden of each county and then to each sub-region according to its population share in the county. For area, on-road, and off-road sources, the annual cost of each control measure was allocated to each sub-region according to its share of emission reductions, which was aggregated from emission reductions at air quality grids.

As described in chapter 3, the average annual costs of all quantified measures from 2002 to 2020 are projected to be $1.64 billion. Table 5-2 shows the projected cost share in each sub-region for all the quantified control measures by implementation jurisdiction. The Chino-Redlands area is projected to have the highest share (10%) of the cost for those measures that would be implemented by the AQMD. The southern portion of Los Angeles County where the harbors and airports are located would share 48 percent of the cost for those measures that fall under the CARB and U.S. EPA jurisdiction. The Chino-Redlands area would have the highest share of the cost related to the transportation control measures. For all the quantified control measures as a whole, the southern portion of Los Angeles County would have an 18 percent share of the total cost, followed by the Chino-Redlands area (11%). For the 1997 AQMP, the eastern and northern portions of Los Angeles County were projected to have a relatively higher share of the costs than the rest of the communities.

TABLE 5-2

Cost Share by Jurisdiction by Sub-region for Quantified Measures

	Jurisdiction							
	AQMD		ARB & US EPA		SCAG		Total	
Sub-region	millions $	%	millions $	%	millions $	%	millions $	%
LA CO Burbank	$7	4%	$6	1%	$26	3%	$39	2%
LA CO San Fernando	14	7%	16	3%	55	6%	85	5%
LA CO West	12	7%	31	6%	44	5%	88	5%
LA CO Central	17	9%	12	2%	54	6%	83	5%
LA CO South Central	8	4%	8	2%	44	5%	60	4%
LA CO South	9	5%	255	48%	40	4%	304	18%
LA CO East	14	7%	16	3%	75	8%	105	6%
LA CO Southeast	11	6%	10	2%	59	6%	80	5%
LA CO Island	0	0%	0	0%	0	0%	0	0%
LA CO Beach	10	6%	22	4%	30	3%	63	4%
LA CO North	3	1%	5	1%	15	2%	23	1%
ORANGE CO North	4	2%	6	1%	36	4%	47	3%
ORANGE CO Central	12	6%	11	2%	66	7%	89	5%
ORANGE CO South	9	5%	14	3%	54	6%	77	5%
ORANGE CO West	10	6%	72	14%	53	6%	135	8%
Northwest Riverside	11	6%	11	2%	77	8%	98	6%
Other Riverside	9	5%	12	2%	53	6%	74	5%
Chino-Redlands	20	10%	19	4%	135	15%	174	11%
Other San Bernardino	6	3%	2	0%	12	1%	19	1%
Total	**$187**	100%	**$528**	100%	**$928**	100%	**$1,643**	100%

JOB IMPACTS BY SUB-REGION

The total projected employment for Los Angeles County is 5.924 million jobs in 2010 and 6.222 million in 2020 without the draft 2003 AQMP. Orange County is projected to have 2.245 million jobs in 2010 and 2.484 million in 2020. Riverside and San Bernardino Counties are projected to have 0.953 and 1.017 million jobs in 2010 and 1.131 and 1.192 million jobs in 2020, respectively.

The distribution of job impacts by sub-region very much mirrors that of quantified benefits and costs. The western, central, and eastern (the San Gabriel Valley) portions of Los Angeles County are projected to have more jobs created than other sub-regions resulting from quantified clean air benefits. In terms of the job impact of quantified control measures, the majority of the jobs forgone are in the southern portion of Los Angeles County and the Chino-Redland area. Unlike other sub-regions, the non-urbanized San Bernardino County is projected to experience 1,369 jobs created instead due to the investments in the transportation control measures.

TABLE 5-3

Job Impacts by Sub-region for Quantified Benefits and Measures

Sub-region	Clean Air Benefit			Quantified Control Measures		
	2010	2020	Average (2002-2020)	2010	2020	Average (2002-2020)
LA CO Burbank	1901	3077	1805	-700	-839	-777
LA CO San Fernando	1915	3400	1950	-1006	-1372	-1157
LA CO West	5886	9550	5565	993	-1496	-455
LA CO Central	3105	5200	2994	921	-1784	-549
LA CO South Central	1381	2309	1319	-659	-1310	-858
LA CO South	1323	2536	1387	-949	-4735	-1946
LA CO East	2532	4591	2581	4008	-1304	397
LA CO Southeast	1040	2128	1137	1565	-1482	-363
LA CO Island	4	6	4	-56	-74	-48
LA CO Beach	1200	2084	1179	1234	-1030	-107
LA CO North	1083	1833	1059	-236	47	-298
ORANGE CO North	1000	1845	1003	332	-722	-260
ORANGE CO Central	1952	3352	1907	-277	-1392	-803
ORANGE CO South	1969	3429	1977	-187	-1020	-585
ORANGE CO West	1777	3044	1724	-978	-3967	-1751
Northwest Riverside	1327	3200	1497	1558	-748	-598
Other Riverside	1996	4028	1986	1216	1078	-576
Chino-Redlands	1372	3709	1712	2057	-4179	-1160
Other San Bernardino	513	1249	586	1386	4141	1369
Total	33275	60570	33371	10222	-22188	-10523

JOB IMPACTS BY RACE AND ETHNICITY

The job impacts discussed in this report represent the net change to the employment trend of an industry. This net change includes a mixture of new hires, layoffs/attrition from the existing work force, and a slowdown in projected job growth. When new hires are greater than layoffs, more jobs will be created. When the reverse is true, there will be jobs forgone. A dynamic economy must undergo such changes in order to grow and adjust to new conditions. These changes can increase productivity and promote greater competitiveness. Furthermore, these changes in the context of the draft 2003 AQMP are necessary to improve the environment, which generates enormous benefits for the public.

The findings from an extensive literature review (Kletzer and Ong, 1994) as well as the Current Population Survey indicate that the chances of being displaced from a job are higher for African Americans and Hispanics than for non-Hispanic Whites and Asians. In addition, the re-employment rates are lower for African Americans and Hispanics than for Asians and non-Hispanic Whites. To account for that disparity this report makes adjustments, as necessary, to the information provided by the 1990 Census data on the distribution of jobs by ethnicity in a given 1-digit SIC industry.[1] The adjusted distributions were used for only those industries which show jobs forgone for the first five years of the draft 2003 AQMP, since much of the near-term impacts may be generated through a combination of forgone growth and layoffs. The impacts in the more distant future tend to be deviations from projected job growth.

Table 5-4 shows the distribution of job impacts by industry and ethnicity for clean air benefits and control measures, respectively. Between 2002 and 2006, it is projected that an average of 6,078 jobs would be created annually resulting from the clean air benefit alone. Job creation would rise to 43,120 jobs annually, on average, from 2007 to 2020. During both time periods, Whites would have a 55 percent share of the average annual jobs gained, followed by Hispanics (29 percent), Asians (9 percent), and African Americans (7 percent).

For the first 5 years of the draft Plan, implementation of quantified control measures would result in 9,654 jobs to be created annually of which Whites would have a 54 percent share, followed by Hispanics (32 percent), Asians (8 percent), and African Americans (5 percent). From 2007 to 2020, quantified control measures are projected to have 20,614 jobs forgone annually, on average. The share of the 20,614 jobs forgone among different race and ethnicity groups are: 54 percent for Whites, 25 percent for Hispanics, 11 percent for Asians, and 9 percent for African Americans.

TABLE 5-4

Average Annual Job Impacts by Ethnicity by Industry for
Quantified Clean Air Benefit and Measures

	Clean Air Benefit									
	2002-2006					2007-2020				
Industry (SIC)	White	Black	Asian	Hispanic	Other	White	Black	Asian	Hispanic	Other
Agriculture (01-09)	20	2	4	39	0	237	19	49	468	3
Durables (24-15,32-39)	189	20	36	134	2	1288	139	245	914	16
Non-Durables (20-30 ex 24-25)	117	13	29	156	2	754	80	185	999	10
Mining (10-14)	3	0	0	1	0	14	1	1	4	0
Construction (15-17)	359	22	27	224	4	2060	127	153	1283	25
Transp. & Pub Util (40-49)	111	26	17	49	2	1702	401	258	756	29
Fin, Ins & Real Est. (60-67)	324	35	54	78	2	1844	200	309	446	13
Retail Trade (52-59)	678	66	143	434	7	4193	408	886	2682	46
Wholesale Trade (50-51)	131	10	26	68	1	1040	81	203	538	10
Services (70-89)	1246	177	201	503	13	7631	1086	1230	3079	80
Government (91-97)	153	43	21	52	2	2763	782	382	931	37
Total	3331	415	558	1737	37	23526	3325	3901	12099	269

[1] The PUMS data from the 2000 census which would be the basis of the ethnic distribution of jobs by industry was scheduled to be released in April 2003, but was not available at the time when this report was produced.

TABLE 5-4
(Continued)

	Quantified Control Measures									
	2002-2006					2007-2020				
Industry (SIC)	White	Black	Asian	Hispanic	Other	White	Black	Asian	Hispanic	Other
Agriculture (01-09)	25	2	5	50	0	-203	-17	-42	-400	-2
Durables (24-15,32-39)	2628	284	499	1865	33	1103	119	209	782	14
Non-Durables (20-30 ex 24-25)	-14	-2	-3	-22	0	-485	-52	-119	-643	-7
Mining (10-14)	-8	-1	0	-3	0	-29	-3	-2	-10	0
Construction (15-17)	3615	222	269	2251	43	2635	162	196	1640	31
Transp. & Pub Util (40-49)	127	30	19	57	2	-1856	-437	-281	-825	-31
Fin, Ins & Real Est. (60-67)	456	50	76	110	3	-999	-109	-167	-242	-7
Retail Trade (52-59)	967	94	204	618	11	-3599	-350	-760	-2302	-39
Wholesale Trade (50-51)	-35	-4	-6	-22	-1	-1766	-137	-345	-913	-18
Services (70-89)	1943	276	313	784	20	-4235	-602	-683	-1709	-44
Government (91-97)	-50	-20	-6	-20	-1	-1713	-485	-237	-577	-23
Total	9654	931	1371	5666	111	-11148	-1910	-2231	-5198	-127

For the 1997 AQMP the job impact analysis was performed for the combined quantified clean air benefits and measures. It was projected that in the first five years of the 1997 AQMP, Whites would have a 57 percent share of the average annual jobs gained, followed by Hispanics (18 percent), African Americans (16 percent), and Asians (8 percent). After the first five years, the share of jobs created for Hispanics and African Americans would increase to 20 and 21 percent, respectively.

JOB IMPACTS ON HIGH- VERSUS LOW-PAYING JOBS

Occupations were grouped into five categories, lowest to highest, according to median weekly earnings. Tabe 5-5 shows the distribution of job impacts in 2010 and 2020 resulting from qantified clean air benefits and control measures, respectively, among various occupational wage groups. All the groups are projected to gain from cleaner air. For quantified control measures, all the groups except for the occupations in the lowest-paying group would have job gains in 2010. In 2020 quantified measures would exert some slight job gains for Group 2 occupations and the rest of groups would have jobs forgone ranging from 0.17 percent to 0.32 percent of the baseline 2020 jobs. The occupations in each group are listed in Table B-1 of Appendix B.

TABLE 5-5

Draft 2003 AQMP Employment Impacts by Occupational Wage Group for Quantified Clean Air Benefit and Measures

Group	Median Weekly Earnings	No. of Occupations	% Impact from Baseline			
			Clean Air Benefit		Control Measures	
			2010	2020	2010	2020
1	$223 - $346	18	0.34%	0.55%	-0.01%	-0.28%
2	$351 - $424	19	0.29%	0.62%	0.08%	-0.32%
3	$437 - $586	18	0.37%	0.60%	0.38%	0.02%
4	$597 - $671	18	0.27%	0.47%	0.07%	-0.17%
5	$694 - $1218	21	0.28%	0.48%	0.22%	-0.17%

IMPACTS ON DISPOSABLE INCOME

Without the draft 2003 AQMP, the real disposable income is projected to grow at an annual rate of 2.30 percent between 2002 and 2020.[2] Quantified clean air benefits of the draft AQMP could increase the annual growth rate to 2.34 percent. Per capita real disposable income (total real disposable income divided by population) would increase slightly by $5.81 per year. On the other hand, the quantified measures would lower the projected growth rate of the real disposable income from 2.30 to 2.28 percent annually. This would result in a decrease in per capita real disposable income by $20.6.

The increase in the real disposable income resulting from quantified clean air benefits more than outweighs its decrease due to the implementation of quantified measures. The absolute magnitude of decrease in per capita real disposable income resulting from quantified control measures is greater than that of increase due to quantified clean air benefits because of the differences in population growth rates. The annual population growth rate from 2002 to 2020 is projected to be 1.437 percent with clear air benefits alone as opposed to the baseline annual growth rate of 1.395 percent. Implementation of quantified control measures is projected to lower the annual population growth rate to 1.376 percent relative to the 1.395 percent baseline rate.

IMPACTS ON PRICE INDEX BY INCOME

The REMI model develops price indexes of consumption goods for households in five income groups by comparing prices of those goods between the four-county region and the rest of the United States. The draft 2003 AQMP is projected to result in increases in the price of consumption goods (those goods identified in the annual Consumer Expenditure Survey by the Bureau of Labor Statistics). Table 5-6 shows the projected percentage change in the price of consumption goods by income group for quantified clean air benefits and control measures, respectively, in the years 2010 and 2020.

[2] The real disposable income for the four county area is projected to be $328 billion in 2002 and $481 billion in 2020. Disposable income is the sum of the incomes of all the individuals in the economy after all taxes have been deducted (Baumol and Blinder, 1982).

The change herein is of the baseline index of consumption goods. The price of consumption goods is projected to decrease by less than one-quarter of a percent in 2010 and 2020 due to the attainment of the clean air standards. The impact does not vary from one income group to another. Implementation of control measures is projected to increase the price of consumption goods from 0.24 to 0.27 percent. The projected increase in the price is due to the pass-through of additional control costs by industries that are affected by a number of control measures.

TABLE 5-6

Draft 2003 AQMP Impacts on the Price of Consumption Goods
for Quantified Clean Air Benefit and Measures
(percent of baseline)

	Clean Air Benefit		Control Measures	
Household Income	2010	2020	2010	2020
1st Quintile	-0.19%	-0.22%	0.25%	0.27%
2nd Quintile	-0.19%	-0.22%	0.25%	0.26%
3rd Quintile	-0.19%	-0.22%	0.25%	0.26%
4th Quintile	-0.19%	-0.22%	0.24%	0.25%
5th Quintile	-0.19%	-0.22%	0.24%	0.24%

SUMMARY

Implementation of the draft 2003 AQMP is projected to result in air quality improvements sufficient to attain the air quality standards by 2010 throughout the Basin. The air quality modeling results have, however, shown the greatest relative improvements and air quality benefit in the eastern portion of the Basin. The San Gabriel Valley is shown to have the greatest share of the monetary value of these improvements. A demographic analysis of the 2000 census showed that 46 percent of the population there is Hispanics. Higher concentration of Hispanics is also expected in the future throughout the four-county area. The Hispanic population is consequently expected to benefit extensively from the draft Plan.

The attainment of the air quality standards in 2010 depends on a full implementation of control measures, as proposed in the draft 2003 AQMP. The costs of these measures will spread throughout various communities. The cost of quantified control measures that represent 30 percent of the total emission reductions towards clean air would exert a relatively higher share on the southern portion of Los Angeles County and the Chino-Redlands area than the rest of the communities.

All the 19 sub-regions are projected to have additional jobs created from cleaner air. All the ethnic groups are expected to have job gains as a result. The combined share of Whites and Hispanics in job gains is projected to be 84 percent. Implementation of quantified control measures would also result in additional jobs to be created between 2002 and 2006 of which Whites are projected to have a 54 percent share and Hispanics would have a 32 percent share. In later years (2007 to 2020), these measures would result in an average of 20,614 jobs forgone annually of which the share of Hispanics is 25 percent and that of Whites is 54 percent.

Job gains from cleaner air would vary slightly among five wage groups comprised of 94 occupations. In 2010, it is projected that all five groups but the lowest-paying group would experience job gains from quantified control measures. In 2020, all five groups but the middle group would face jobs forgone. On the other hand, there is no significant difference in impacts expected for high- versus low-paying jobs. There is no significant difference in impacts on the price of consumption goods from one income group to another. These findings are only preliminary and require further evaluation during individual rule adoption hearings.

For the 1997 AQMP where the analysis of quantified measures and benefits was combined, it was projected that all ethnic groups would be expected to have a net job gain. No significant differences were identified in impacts on high- versus low-paying jobs, or on the price of consumption goods from one income group to another.

Implementation of the unquantified measures could result in employment impacts on ethnic groups. A detailed analysis cannot, however, be performed on unquantified measures until they are fully quantified relative to their costs. The distribution of job impacts on ethnic groups resulting from quantified measures and benefits needs to be further explored with the use of additional and more recent data. The AQMD will further examine these issues in future efforts.

Additional surveys on affected groups and communities need to be developed to better understand the detailed job impacts. Furthermore, additional tools need to be developed relative to presenting socioeconomic and air quality data geographically. Chapter 8 has a more detailed description of these proposed future enhancements to the socioeconomic analysis.

CHAPTER 6

IMPACTS ON COMPETITIVENESS

Introduction

Region’s Share of U.S. Jobs

Product Prices and Profits

Imports and Exports

Summary

INTRODUCTION

Regional economic competitiveness depends on various factors including business costs, workforce quality, public infrastructure, quality of life, and the regulatory environment. Air quality regulations directly affect business costs, quality of life and the regulatory environment. Specifically, the draft 2003 AQMP will affect regional economic competitiveness in two ways: (1) by imposing costs on business as a result of pollution control strategies; and (2) by improving the region's quality of life by reducing air pollution.

It is not possible at this time to quantify the costs associated with every control measure and benefits associated with every effect of clean air. Of all the intended emission reductions for cleaner air, only 30 percent can be quantified. Costs for the other measures are not available at this time because control methods, control efficiencies, emission reductions, or costs of control technologies are not presently known. The REMI model, used to analyze potential impacts of the draft 2003 AQMP, projects possible impacts on product prices, profits, exports, and imports based upon the input of spending and annualized costs for each control measure and benefit data for each effect of clean air. The reliability of such projections is dependent upon the validity of the input. The AQMD staff believes that it would be inappropriate to make assumptions relative to cost impacts on product prices, profits, exports, and imports for unquantified measures. The analysis contained herein, therefore, considers only those measures and benefits for which quantification is available.

REGION’S SHARE OF U.S. JOBS

Table 6-1 shows the impacts of quantified benefits and measures on the region's share of national jobs. As the air gets cleaner, the four-county region is predicted to gain a larger share of total national jobs through 2020. The increase ranges from 0.01 to 0.03 percent, as compared to the baseline projection without the AQMP. The similar trend and magnitude are also observed for the region’s share of manufacturing jobs in the nation.

As investments in infrastructure and pollution control equipment or devices occur in the beginning of a control measure’s implementation period (e.g., the year 2006), the region will continue its trend of having a larger share of the total national jobs and national manufacturing jobs. However, as the costs of implementing these measures are continually amortized over the project period, fewer jobs would be created, thus resulting in a smaller increase in the region’s share of national jobs (e.g., the year 2010). Over time, this share becomes even smaller as compared to the baseline projection without the AQMP (the year 2020).

Due to the extremely small values presented here, either the quantified benefits or the quantified measures are not expected to result in discernible differences in the four-county region's share of national jobs over the analysis period.

TABLE 6-1

Impacts on Region's Share of U.S. Jobs for Quantified Benefits and Measures (percent)

	Percent Share of U.S. Jobs for Quantified Benefits			Percent Share of U.S. Jobs for Quantified Measures		
	2006	2010	2020	2006	2010	2020
Total Jobs						
With Quantified Benefits	5.47	5.56	5.67			
With Quantified Measures				5.49	5.55	5.62
Without 2003 AQMP	5.47	5.54	5.63	5.47	5.54	5.63
Difference	0.01	0.02	0.03	0.02	0.01	-0.01
Manufacturing Jobs						
With Quantified Benefits	5.44	5.34	5.08			
With Quantified Measures				5.50	5.36	5.04
Without 2003 AQMP	5.44	5.32	5.04	5.44	5.32	5.04
Difference	0.01	0.02	0.03	0.07	0.04	-0.01

PRODUCT PRICES AND PROFITS

Relative to product prices, the REMI model assumes that national industries absorb additional production costs, while regional industries pass these costs on to consumers (all users of products). Industries with more than 50 percent of its sales outside of a region are national and those with more than 50 percent of its sales inside of a region are regional. The impact of additional production costs on national industries will be changes in profits, but the impact on regional industries will be changes in selling prices. The REMI model calculates a composite index of product prices and profits for industries in the four-county region relative to those in the rest of the United States. An index of 1 indicates that the product prices and profits in the region are relatively the same as those in the rest of the United States. An index of product prices above or below 1 means that product prices in the four-county areas are higher or lower, respectively, than those in the rest of the United States. The same is said of profits.

Table 6-2 shows the percentage difference in product prices relative to the baseline for regional industries, respectively, for quantified benefits and measures in 2010 and 2020. Cleaner air would result in a decrease in product prices for all industries. The trucking and warehousing industry (SIC 42) would have the highest reduction in its product price due to congestion relief. Implementation of quantified measures, on the other hand, would increase product prices for the majority of sectors. The industry of other transportation (SICs 44, 46-47) where water transportation belongs would face the higher increase in its product price, which is approximately 10 percent of the baseline price index in 2020. This is due to the requirements in a few marine measures.

TABLE 6-2

Impacts on Product Prices of Regional Industries Relative to
Those in U.S. for Quantified Benefits and Measures (percent of sales)

Industry (SIC)	Quantified Benefits 2010	Quantified Benefits 2020	Quantified Measures 2010	Quantified Measures 2020
Stone, Clay, etc. (32)	-0.74%	-0.84%	0.46%	0.38%
Printing (27)	-0.34%	-0.40%	0.35%	0.26%
Petroleum Products (29)	-0.41%	-0.43%	0.50%	0.56%
Mining (10,12-14)	-0.07%	-0.04%	0.31%	0.18%
Construction (15-17)	-0.30%	-0.34%	0.55%	0.33%
Railroad (40)	-0.22%	-0.33%	0.36%	0.61%
Trucking (42)	-6.01%	-6.55%	0.82%	0.60%
Local/Interurban (41)	-0.20%	-0.27%	0.24%	0.18%
Air Transp. (45)	-0.27%	-0.36%	0.48%	0.80%
Other Transp. (44,46-47)	-0.21%	-0.27%	3.31%	10.03%
Communication (48)	-0.16%	-0.20%	0.30%	0.19%
Public Utilities (49)	-0.16%	-0.19%	0.41%	0.29%
Banking (60)	-0.26%	-0.32%	0.28%	0.16%
Insurance (63,64)	-0.13%	-0.19%	0.22%	0.14%
Credit & Finance (61-62,67)	-0.16%	-0.20%	0.26%	0.15%
Real Estate (65)	0.18%	0.39%	0.05%	-0.15%
Eating & Drinking (58)	-0.21%	-0.27%	0.22%	0.16%
Rest of Retail (52-57,59)	-0.12%	-0.17%	0.21%	0.13%
Wholesale (50-51)	-0.13%	-0.19%	0.21%	0.13%
Personal Serv. & Repair (72,76)	-0.18%	-0.22%	0.25%	0.15%
Private Household (88)	-0.05%	-0.19%	0.16%	0.08%
Auto Repair/Serv. (75)	-0.24%	-0.29%	0.25%	0.18%
Misc. Busi. Serv. (73)	-0.17%	-0.21%	0.26%	0.14%
Amuse. & Recreation (79)	-0.22%	-0.25%	0.25%	0.14%
Motion Pictures (78)	-0.28%	-0.32%	0.27%	0.18%
Medical (80)	-0.11%	-0.15%	0.19%	0.14%
Misc. Prof. Serv. (81,87,89)	-0.18%	-0.22%	0.27%	0.13%
Education (82)	-0.10%	-0.08%	0.22%	0.09%
Non-Profit Org. (83-84,86)	-0.09%	-0.10%	0.20%	0.10%
Agri/Forest/Fish Serv. (07-09)	-0.12%	-0.21%	0.81%	0.87%

Table 6-3 shows the impact of the AQMP on profits for national industries, respectively, for quantified benefits and measures. All industries shows increased profits as air gets cleaner. The additional cost of doing business from the quantified measures would reduce the profits of industries. On average, profits for the majority of national industries will decrease by less than one-half percent of the baseline profit index. The relatively higher profit reduction in the leather industry is due to a higher absolute cost for this industry relatively to its representation in the four-county economy as the costs for Control Measure TCM-1B (Transit and Systems Management) were shared among all the industries according to their relative representation.

TABLE 6-3

Impacts on Profits of National Industries Relative to Those in U.S. for Quantified Benefits and Measures (percent of sales)

Industry (SIC)	Quantified Benefits		Quantified Measures	
	2010	2020	2010	2020
Lumber (24)	0.35%	0.40%	-0.36%	-0.29%
Furniture (25)	0.17%	0.21%	-0.30%	-0.21%
Primary Metals (33)	0.36%	0.41%	-0.31%	-0.20%
Fabricated Metal (34)	0.23%	0.28%	-0.28%	-0.20%
Industrial Machinery & Equipment (35)	0.08%	0.11%	-0.17%	-0.11%
Elect. Equipment (36)	0.13%	0.17%	-0.21%	-0.13%
Motor Veh. (371)	0.28%	0.33%	-0.24%	-0.18%
Rest of Transp. Equip. (372-379)	0.10%	0.13%	-0.24%	-0.17%
Instruments (38)	0.16%	0.20%	-0.26%	-0.16%
Misc. Manuf. (39)	0.28%	0.34%	-0.29%	-0.22%
Food (20)	0.23%	0.26%	-0.22%	-0.19%
Textiles (22)	0.20%	0.25%	-0.30%	-0.26%
Apparel (23)	0.19%	0.23%	-0.32%	-0.29%
Paper (26)	0.35%	0.41%	-0.41%	-0.25%
Chemicals (28)	0.47%	0.54%	-0.36%	-0.25%
Rubber (30)	0.37%	0.40%	-0.29%	-0.21%
Leather (31)	0.40%	0.47%	-0.63%	-0.51%
Hotels (70)	0.30%	0.38%	-0.29%	-0.22%

IMPORTS AND EXPORTS

Table 6-4 summarizes the overall impact of quantified measures and benefits, respectively, on the region's exports and imports relative to the baseline projections. Cleaner air will increase quality of life for residents and make the area more attractive to live and competitive for businesses. As more people migrate to the area, the additional supply of labor would dampen real wage rates, thereby lowering production costs and product prices or increasing profits. As a result, industry production is projected to rise relative to its baseline condition. The increased production would translate to increases in exports and in satisfying the additional demand from local residents and other industries. Part of the demand increase is projected to be fulfilled by increases in imports.

Implementation of quantified measures is projected to increase output production in the region in beginning years as investments are pouring in (2005 and 2010). This trend would be reversed in later years as the regulated community faces the impact of additional cost of doing business. Demand for additional investments and other goods and services would be satisfied mostly by increases in imports in early years. In later years, demand for goods and services would decline because of the current and carry-over effects of higher product prices resulting from pass-through of additional control costs by affected regional industries and lower profitability of national industries. The similar trend is observed for exports too. The dampened demand would also result in a reduction in imports.

It should be noted that the magnitude of all of these directional changes is relatively small when compared with the overall size of the four-county economy. For example, exports are projected to decrease by 0.18 percent of the baseline exports in 2020 resulting from implementing quantified measures.

TABLE 6-4

Impacts on Imports and Exports for Quantified Benefits and Measures

	Quantified Benefits				Quantified Measures			
	2005	2010	2015	2010	2005	2010	2015	2010
Demand*	+	+	+	+	+	+	-	-
Imports	+	+	+	+	+	+	-	-
Self Supply*	+	+	+	+	+	-	-	-
Exports	+	+	+	+	-	-	-	-
Ouput (Production)	+	+	+	+	+	+	-	-
Selling Price	-	-	-	-	+	+	+	+
Profit	+	+	+	+	-	-	-	-

A plus or minus sign means that there is an increase or decrease in the value of that economic variable resulting from the quantified measures and benefits of the draft 2003 AQMP relative to the baseline economic activities.

*Include changes in demand due to changes in control requirements.

SUMMARY

The results of this chapter show that the quantified measures and benefits of the draft 2003 AQMP are not expected to result in discernible differences in the four-county region's share of national jobs. For the majority of sectors, the impact on product prices is projected to be less than one-half of one percent of the baseline index of product prices and the impact on profits is projected to be less than one-half of one percent of the baseline index of profits. The impact on imports and exports is small as well.

The competitive analysis focuses on the impact on various sectors of the local economy. Individual control measures could result in impacts on individual companies. Competitiveness at the company level will be further considered during individual rulemaking procedures.

The actual effects of the draft 2003 AQMP (including unquantified measures and benefits) on regional competitiveness could vary from the projected effects of quantified measures and benefits for several reasons. First, the analysis assumes that all control costs are "extra" costs when compared to air pollution control costs in other regions. This ignores the fact that competing regions tend to follow the AQMD's lead and adopt control measures with objectives similar to those proposed in the AQMD or at a minimum have some level of control with its consequent costs. For example, a number of eastern states have adopted the California vehicle exhaust standards. Furthermore, a number of on-road and off-road measures reflect implementation of national standards on mobile sources. Second, the socioeconomic analysis underestimates the benefits from clean air that would increase regional attractiveness. Third, the AQMD is continuing to implement special programs to foster economic competitiveness in the region. These programs cover two broad strategies:

(1) Reducing costs of meeting air quality mandates through the use of market incentive approaches and educational programs on consumer awareness; and

(2) Business assistance programs, such as permit streamlining programs, small business assistance programs, economic development and business retention programs, and air quality assistance funding.

Finally, costs of unquantified measures may also affect competitiveness if they are implemented solely in the region. The impact of proposed air quality regulations on competitiveness will be examined during the rulemaking process for each proposed rule. Chapter 8 has a more detailed description of proposed enhancements to future assessments.

CHAPTER 7

ASSESSMENT OF CEQA ALTERNATIVES

Introduction

Description of Alternatives

Air Quality Benefits of Alternatives

Comparison of Socioeconomic Impacts

Summary

INTRODUCTION

The California Environmental Quality Act (CEQA) requires that the AQMD propose alternatives to the draft 2003 AQMP. These alternatives include a range of reasonable options that could feasibly meet the project objective. This chapter addresses the socioeconomic impacts of the alternatives proposed in the draft EIR.

DESCRIPTION OF ALTERNATIVES

The draft EIR for the draft 2003 AQMP identifies the following five alternatives to the proposed Plan:

No Project Alternative (1997/1999 AQMP)

This alternative is based on the 1997/1999 State Implementation Plan and excludes all the measures that have been adopted. The net effect of the No Project alternative would be a continuation of the existing 1997/1999 AQMP as approved by the California Air Resources Board (CARB) and U.S. EPA.

Less NOx Reduction Alternative

This alternative assumes no NOx emission reductions from U.S. EPA's on- and off-road mobile sources. Compared to the draft Plan, this alternative excludes Control Measures AIRPORT-1 (Emission Reductions from Jet Aircraft), MARINE-1 (More Stringent Emission Standards for New Harbor Craft and Ocean-going Ships), and MARINE-3 (Cleanup of Existing Ocean-going Ship Fleet). Second, only two-thirds of on-road heavy-duty vehicles affected by Control Measure ON-RD HVY-DUTY-3 (Cleanup of Existing Truck/Bus Fleet) in the draft Plan would be subject to this alternative since one-third of emissions are assumed under the federal jurisdiction (i.e., 49-state vehicles). Third, there will be fewer NOx emission reductions from Tier I of Long-term Measure under this alternative.

More VOC and Less NOx Reduction Alternative

This alternative is the same as the Less NOx Reduction alternative in terms of exclusion of federal on- and off-road sources. Furthermore, this alternative requires approximately additional 60 tons of VOC reductions from Tier II of Long-term Measure due to a potentially lower carrying capacity for VOC in the year 2010.

More VOC Reduction Alternative

This alternative has a more aggressive control of VOCs towards the one-hour and 8-hour ozone and 24-hour and average annual PM2.5 standards, in addition to the draft 2003 AQMP. All the additional emission reductions (60 tons per day) would be reflected in Long Term Tier II Measure, of which one-third would come from the AQMD sources and the remaining two-thirds from the CARB's on- and off-road mobile sources.

Least Toxics Alternative

In addition to the draft 2003 AQMP, this alternative includes additional controls on heavy-duty vehicles, ships, and agricultural pumps in order to achieve lower toxic emissions. It was assumed that 50 percent of heavy-duty vehicles with model years 1994 and beyond would be retrofitted with diesel particulate filters between 2005 and 2010. Seventy-five percent of the docking ships were assumed to use on-shore power and 75 percent of stationary agricultural pumps would be electrified between 2005 and 2010.

AIR QUALITY BENEFITS OF ALTERNATIVES

This socioeconomic analysis compares the air quality benefit resulting from implementation of the draft Plan with respect to the baseline "no control" scenario for ozone, PM10, and visibility. The draft 2003 AQMP has been demonstrated to attain the federal PM10 standards in 2006 and the federal ozone standard in 2010. The same can be said of all other alternatives except for the No Project Alternative. The draft 2003 AQMP along with all other alternatives is projected to attain the state visibility standard in 2010.

COMPARISON OF SOCIOECONOMIC IMPACTS

Table 7-1 compares the direct costs, direct air quality benefits, and job impacts of the various alternatives to the draft 2003 AQMP. The monetary cost and benefit analysis includes both quantified and unquantified measures and quantified benefits. Since the socioeconomic assessment is performed on an annual basis, no job analysis can be performed for the unquantified control measures. The quantified measures represent only 30 percent of the intended emission reductions for clean air. Therefore, the job analysis for the cost side in Table 7-1 represents the job impacts from implementing only 30 percent of the emission reductions. The clean air benefit in Table 7-1, on the other hand, depicts the air quality benefit of all the intended emission reductions for attainment. Therefore, its associated job impact includes the air quality benefit of all the emission reductions. All the alternatives as well as the draft Plan use the same estimate for the congestion relief benefit and SCAG transportation control measures.

TABLE 7-1

Average Annual Impacts of AQMP Alternatives versus Draft 2003 AQMP

Alternatives	Costs		Quantified Benefits	
	Millions of 97 Dollars	Jobs	Millions of 97 Dollars	Jobs
Draft 2003 AQMP	$3,069	-10,523	$7,370	33,372
No Project	1,278	-1,736	4,971	30,755
Less NOx Reduction	2,889	-10,477	6,814	33,123
More VOC/Less NOx Reduction	3,166	-10,477	7,299	33,702
More VOC Reduction	3,337	-10,523	8,564	34,741
Least Toxics	3,315	-13,320	8,644	34,715

All the alternatives and the draft 2003 AQMP show higher air quality benefits than the costs which are necessary to get there. However, uncertainty regarding the cost estimation for the unquantified measures exists because this portion of the cost is based on the average cost of quantified measures and only 30 percent of emission reductions belong to the quantified measures. The No Project alternative does not attain the air quality standards and thus shows the least air quality benefit (about $5 billion). The Least NOx Reduction alternative has the least air quality benefit and the Least Toxics alternative has the highest air quality benefit among all the alternatives attaining the federal and state air quality standards. Eighty-nine percent of the incremental benefit between the Least Toxics alternative and the draft 2003 AQMP is due to the visibility improvement. Overall, the visibility aesthetic benefit under the Least Toxics alternative is 35 percent higher than the draft 2003 AQMP in 2010. At the sub-region level, the visibility aesthetic benefit in the south central area of Los Angeles County under the Least Toxics alternative is projected to be 41 percent higher than that under the draft 2003 Plan. The northern portion of Los Angeles County is projected to be 41 percent higher while the central portion of Orange County is 47 percent higher. Table 7-2 shows the distribution of quantified benefits for all the alternatives among different benefit categories.

TABLE 7-2

Distribution of Average Annual Quantified Benefits by Category for All Alternatives (millions of 1997 dollars)

Alternatives	Total	Health	Visibility	Congestion Relief	Material	Crop Yield
Draft 2003 AQMP	$7,370	$1,925	$3,906	$1,450	$70	$19
No Project	4,971	1,611	1,835	1,450	57	19
Least NOx Reduction	6,814	1,633	3,652	1,450	59	19
More VOC/Less NOx Reduction	7,299	1,703	4,062	1,450	65	20
More VOC Reduction	8,564	2.071	4,948	1,450	76	20
Least Toxics	8,644	2,078	5,043	1,450	74	19

In terms of monetary costs, the No Project alternative is the least expensive because it contains the fewest control measures. The difference between the draft 2003 AQMP and the More VOC Reduction alternative resides only in the unquantified Tier II long-term strategy. The difference between the draft 2003 AQMP and the Least Toxics alternative is the additional control on heavy-duty vehicles, ships, and agricultural pumps for the latter. The cost of such additional control is fully quantified. The difference between the draft 2003 AQMP and the Least NOx Reduction alternative is the lesser cost employed on on- and off-road mobile sources which is reflected in both quantified and unquantified (long term Tier I strategy) measures for this alternative.

In terms of the job impact, cleaner air would foster continued growth of the local economy as shown in the last column of Table 7-1. Implementation of quantified control measures, on the other hand, would slow down the economy mainly due to the additional cost of doing business employed on the regulated community. Among all the alternatives that are projected to meet the air quality standards, the Least Toxic alternative would produce the highest number of jobs forgone (but it also has the highest incremental benefit relative to incremental cost when compared with the draft 2003 AQMP). The job impacts of the cost and benefit sides cannot be compared with each other because the former reflects only 30 percent of the total emission reductions while the latter includes all the emission reductions.

SUMMARY

The No Project alternative would not reach the attainment of air quality standards. All other alternatives display few variations in monetary costs than in monetary benefits. Except for the No Project alternative, the job impact of quantified measures shows fewer variations among alternatives than that of quantified benefits.

CHAPTER 8

RECENT REFINEMENTS AND FUTURE ACTIONS

Introduction
Benefits of Clean Air
Costs of Clean Air
Distributional Impacts
Competitiveness
Enhancements

INTRODUCTION

The socioeconomic report for the 1997 AQMP identified key areas for future refinements. This chapter discusses the progress in these refinements. Despite the use of a variety of tools and the inclusion of these refinements in assessing the socioeconomic impacts of the draft 2003 AQMP, the tools and refinements are not capable of addressing all of the previously identified public policy questions. The assessment of some of these issues requires linking information from multiple fields and data that is currently unavailable. Overcoming these constraints will require interdisciplinary research, data collection, and a combination of approaches. The AQMD plans to continue to work with the Scientific, Technical and Modeling Peer Review Advisory Group (STMPRAG), the Ethnic Community Advisory Group (ECAG), the Local Government and Small Business Assistance Advisory Group, and other interested parties to improve its socioeconomic assessments.

Alternative approaches to issues not able to be addressed in the draft 2003 AQMP will be pursued for use in the socioeconomic assessments of future AQMP revisions. Described below are recent refinements and alternative approaches/issues that need to be further explored. The AQMD will also explore the potential to jointly fund these projects with other agencies and the business community.

BENEFITS OF CLEAN AIR

The socioeconomic assessment of the draft 2003 AQMP makes significant progress in quantifying several benefits of improved air quality including congestion relief, visibility improvements, and crop yields.

Congestion relief benefit has been expanded to include benefits from reduced vehicle hours traveled (VHT) in addition to reduced vehicle miles traveled (VMT). VHT benefit was divided into business and commute trips. The visibility benefit assessment approach is also updated with the most recent data and developments in the economic field. The Beron et al. (2001) study used sales prices of owner-occupied single-family homes between 1980 and 1995 as well as socioeconomic and housing characteristics of these homes and visibility data at the census tract level to arrive at a willingness to pay (price of visibility) for visibility. The research was performed for the counties of Los Angeles, Orange, Riverside, and San Bernardino. The willingness to pay was shown to be related to the percentage of college degree of people 25 years or older, net income (household income minus housing cost), and visibility (in miles) at each location.

The agricultural benefit analysis has been significantly refined with the specific location of the crops and acreage. This information is spatially joined with the Public Land Survey (PLS) grid system (1 mile by 1 mile) and the air quality modeling grid system (5 kilometer by 5 kilometer) to estimate the additional crop yields from cleaner air at the air quality grid level.

Except for the material benefit assessment, all other benefit assessments were performed either at the air quality grid level or the sub-region level which is in sharp contrast to the past approach where more aggregated air quality data at the county or basinwide level was utilized. This new approach provides finer details on clean air benefits geographically.

Progress on the health benefit assessment of future AQMPs and other AQMD actions will continue. The interpretation of assessments will become increasingly important as more dimensions are added to quantitative and qualitative measurements of health effects. Previous refinements suggested in the 2003 AQMP that may be implemented in future AQMPs include the consideration of changes in life expectancy, the number of premature deaths, the separate effects of different pollutants to help examine the correlation between pollutants, and the study of at-risk populations to reduce potential double counting of health effects of pollutants and to identify significant pollutant thresholds for health impacts. The AQMD also intends to fund future research examining a possible linkage between smog and brain cancer and to establish an asthma and air pollution research center.

COSTS OF CLEAN AIR

There are 40 control measures in the draft 2003 AQMP of which 36 control measures (representing 30 percent of the total intended emission reductions) were quantified with costs. For each quantified measure in the 2003 AQMP, the refined cost estimation approach began at the facility level for point sources and at the air quality modeling grid level for area, on-road, and off-road sources. The cost assessment for transportation control measures was performed at the sub-region level. This approach directly links costs to emission sources and thus reduce the uncertainty in cost allocation.

Additional measures will be quantified as affected sources are specifically identified and control technology becomes known. The AQMD will be working with the CARB and U.S. EPA to help advance technology in the unknown area. Furthermore, the AQMD is exploring the expansion of its regulatory program to include mobile sources pending additional legal authority.

Projected costs of control measures are very often different from the actual costs. Actual costs are generally thought to be lower than the projected costs due to cost reductions resulting from innovative technologies. In addition, the AQMD has revised compliance dates as necessary for rules where the projected technology is unavailable for implementation. However, several members of the STMPRAG have suggested the possibility that as the AQMD becomes closer to its attainment goals for various pollutants the cost in achieving the final increment towards attainment might actually result in higher costs than projected. It is also not clear whether the costs associated with maintaining attainment of various pollutants will be reflective of the currently projected costs. The AQMD has been closely working with the CARB to study the actual costs of three AQMD rules.

To increase regulatory flexibility, the AQMD has proposed alternatives to command-and-control regulations. These alternatives include a mitigation fee type program for federally mandated sources and an emission fee program for port-related vehicles. The AQMD is committed to quantifying the costs of these alternatives and identifying which groups might be affected disproportionately in future AQMPs.

DISTRIBUTIONAL IMPACTS

The REMI model, which is used for assessing direct and indirect impacts on various entities on the local economy has been refined from a county-based geography to a sub-county geography. The division into 19 sub-regions is to further align costs of control measures, benefits of clean air, and macroeconomic impacts at a smaller geographic level. The linkage between emissions, ambient concentration of pollutants, and the 2000 Census data provides a baseline socioeconomic profile of affected sources as well as economic impacts of emission reductions on the local economy. This effort also represents integration of several disciplines in terms of data alignment. For example, emission and pollutant concentration data is compiled more towards geographic divisions than the socioeconomic data which is displayed according to political boundaries.

Additional efforts have been made to improve the analysis of impacts upon specific industries, small businesses, and minority owned businesses. Much of this is necessitated by the nature of the rules being implemented that tend to be more specialized in nature and to focus on smaller and previously unregulated industries.

To this end, the AQMD has worked with BBC Research and Consulting to develop a methodology for conducting facility based and post rule assessments. Two case studies on the woodworking and dry cleaning industries were performed. Facility based assessments can be used during the rule development process to better analyze the effect of a proposed regulation on specific segments of an industry. Facility based assessments that use time series data can establish historical perspective and future outlook of affected industries across geographical areas.

The AQMD is also looking into methods of assessing environmental justice concerns where particular areas or sub-populations have experienced a disproportionate burden of negative air quality impacts. These approaches will continue to be utilized, as necessary, in the rulemaking and post-rulemaking process.

COMPETITIVENESS

Local firms that sell products in national or international markets have to compete with firms located in less polluted regions or those subject to fewer regulations. Existing tools for the analysis of competitiveness focus on the impacts at the national or macroeconomic level. Impacts at this level are normally small, statistically insignificant, or inconclusive. Since the 1994 AQMP, the AQMD has focused more on examining profiles of companies affected by individual rules to supplement the macro-level analysis. The profiles include annual sales of average firms, the total number and size of affected firms, and the number of employees and profit margins of affected firms. This micro-level analysis is possible in those instances where affected companies can be specifically identified and reliability of data on their profile can be verified.

The AQMD is preparing to develop additional parameters for evaluating competitiveness impacts. Refinements suggested in the 2003 AQMP include analyzing the share of locally-produced goods in total sales, firms moving out of the area or going out of business, changes in profits, the use of substitute products, and changes in the pattern of industrial organizations. This approach will help examine the extent to which clean technology induces innovation that creates new economic opportunities and thus increases competitiveness in the region.

ENHANCEMENTS

The 1997 AQMP socioeconomic analysis identified actions that would further enhance the ability to quantify and evaluate the benefits and costs of the proposed Plan. This socioeconomic analysis has accomplished several of these actions and identified others for still future assessment. Table 8-1 summarizes enhancements that have been accomplished and those still recommended for further action in the assessment of the year 2006 AQMP.

Future enhancements on health benefit assessments would include the identification of individual pollutant effects and of significant thresholds for health impacts. The STMPRAG has suggested that the air quality, land use, and socioeconomic models be merged to facilitate impact assessments for additional parameters. The greater use of GIS to perform more sophisticated spatial analyses is proposed for assessing distributional impacts. Building a time series data base and timely converting to a North American Industrial Classification System (NAICS) would enhance the assessment on specific segments of an industry and facilitate the alignment with published governmental statistics.

Finally, The REMI model used to assess the economic impacts of the 2003 Draft AQMP may be enhanced to include the effects of previous regulations and the differential effect of regulations on small businesses.

TABLE 8-1

Enhancements Achieved and Proposed for Future Action

Topic	Achieved	Proposed for Future
Benefit **Quantitative & Qualitative Benefit Assessments**	• Quantify benefits from reductions in vehicle hours traveled. • Assess benefits for greater geographical details • Update the visibility benefit estimate. • Establish air quality research center to further assess health impacts.	• Estimate changes in life expectancy (1997).[1] • Separate multiple pollutant effects (1997). • Examine at-risk population (1997).
Cost **Evaluation of Costs and Flexible Regulatory Approaches**	• Quantify costs at source locations. • Continue the use of the mitigation fee and emission fee concepts.	• Examine differences between command-and-control regulations and pricing or subsidies (1994).[2] • Work with the CARB to examine post rule costs.
Distributional Impacts **Geographic Information System (GIS)**	• Develop facility based assessment to analyze specific segments of affected industries. • Analyze macroeconomic impacts at sub-county level for differential impacts.	• Produce more detailed sub-region analyses through GIS. • Merge air quality, land use, and socioeconomic models.
Competitiveness **Impact of Regional Regulations on Competitiveness**	• Use firm and industry profiles to perform segmentation study of an industry.	• Assess the impact of innovation on competitiveness. (1994) • Build time series data base for trend analysis. • Convert to NAICS for comparable statistics.

[1]Origionally proposed in the 1997 AQMP Socioeconomic Report.
[2]Origionally proposed in the 1994 AQMP Socioeconomic Report.

APPENDIX A

ASSESSMENT METHODOLOGY

Introduction

Costs

Benefits

Other Socioeconomic Impacts

INTRODUCTION

The socioeconomic assessment of the draft 2003 AQMP is divided into three segments: cost, benefit, and employment and other impacts. The following describes how each segment is assessed.

COSTS

Table A-1 lists, in the draft 2003 AQMP, the 40 short- and long-term stationary and mobile measures and shows, for each measure, whether cost data is available. Cost data is not available for those measures where control methods are unknown, or affected sources cannot be identified.

Quantifiable Control Costs

Of the 40 short- and long-term measures, cost data have been developed for 36. In some cases, costs are estimated for combined measures.

Direct costs from complying with the requirements of control measures include capital expenditures on control equipment, annual operating and maintenance costs for the equipment, costs of low-polluting (e.g. reformulated) materials, and potential savings related to new requirements. Investments in transportation projects, their annual operating and maintenance costs, and the resulting savings in automobile operating and maintenance costs from these projects are also accounted for. Capital costs are annualized based on a 4-percent real interest rate and the economic life of equipment or a project.

Cost estimates for SCAG transportation measures are provided by SCAG. For measures under the CARB and U.S. EPA jurisdictions, cost estimates were developed based on the assumptions provided by ARB. Control cost estimates for all other measures are based on information from equipment vendors, raw material manufacturers, and affected industries.

Projected Control Costs

Cost effectiveness, which represents the cost to reduce a ton of pollutant, was developed by respective agency for each control measure with data on costs and emission reductions. For measures that reduce emissions from more than one pollutant emission reductions from one-seventh of CO and all the other pollutants were summed (CARB, 1990). This total emission reductrion number was then used to calculate the proportion of emissions reductions for the associated control measure within a source category. The weighted cost effectiveness by source category was then computed by summing the products from multiplying cost effectiveness by the proportion across all the measures in that source category.

The annual costs of unquantifiable measure were approximated by multiplying the weighted cost effectiveness by the 2010 emission reductions from the unquantifiable measures.

TABLE A-1

Draft 2003 AQMP Control Measures

Control Measure No.	Control Measure Title	Cost Data Available	No Cost Data
SHORT-TERM MEASURES			
	AQMD Jurisdiction		
CTS-07	Further Emission Reductions of Architectural Coatings (R1113) (VOC)	X	
CTS-10	Misc. Industrial Coating & Solvent Operations (VOC)	X	
FUG-05	Emission Reductions from Fugitive Emission Sources (VOC)	X	
CMB-07	Emission Reductions from Petroleum Refinery Flares (SOx)		1
CMB-09	Emission Reductions from Petroleum FCCU (PM10, PM2.5, NH3)	X	
CMB-10	Additional NOx Reductions for RECLAIM	X	
BCM-07	Further PM10 Reductions from Fugitive Dust Sources (PM10)		2
BCM-08	Aggregate & Cement Plant Manufacturing Operations (PM10)	X	
PRC-03	Emission Reductions from Restaurant Operations (PM10)	X	
PRC-07	Industrial Process Operations (VOC)	X	
WST-01	Emissions Reductions from Livestock Waste (VOC, NH3)	X	
WST-02	Emission Reductions from Composting (VOC, NH3, PM10)	X	
MSC-05	Truckstop Electrification (ALL)	X	
	CARB & US EPA Jurisdiction		
CONS-1	Set New Consumer Product Limits for 2006	X	
CONS-2	Set New Consumer Product Limits for 2006-2010	X	
FVR-1	Recover Fuel Vapors from Above Ground Storage Tanks	X	
FVR-2	Recover Fuel Vapors from Gasoline Dispensing at Marinas	X	
FVR-3	Reduce Fuel Permeation through Gasoline Dispenser Hoses	X	
L/M DUTY-1	Replace/Upgrade Emission Control System on Existing Passenger Vehicles	X	
L/M DUTY-2	Smog Check Improvements	X	
ON-RD HVY DUTY-1	Community-based Truck and Bus Highway Inspections	X	
ON-RD HVY-DUTY-2	Capture and Control Vapors from Gasoline Cargo Tankers	X	
ON-RD HVY DUTY-3	Clean up Existing Truck/Bus Fleet	X	
OFF-RD CI-1	Lower Emission Standards-New Off-Road Compression Ignition Engines	X	
OFF-RD CI-2	Clean up Existing Heavy-Duty Off-Road Equipment Fleet	X	
OFF-RD CI-3	Register & Inspect Existing Off-Road Equipment to Detect Excess Emiss.	X	
OFF-RD LSI-1	Lower Emission Standards for New Off-Road Gas Engines	X	
OFF-RD LSI-2	Clean up Existing Off-Road Gas Equipment Through Retrofit Controls	X	
OFF-RD LSI-3	Require New Forklift Purchases & Rentals to be Electric	X	
SM OFF-RD-1	Lower Emission Standards for Handheld Lawn & Garden Equipment	X	
SM OFF-RD-2	Lower Emission Standards for Non-Handheld Lawn & Garden Equipment	X	
MARINE-1	More Stringent Emission Standards for New Harbor Craft & Ocean Ships	X	
MARINE-2	Clean up Existing Harbor Craft Fleet	X	
MARINE-3	Clean up Existing Ocean-going Fleet	X	
AIRPORT-1	Reduce Emissions from Jet Aircraft	X	
	SCAG Jurisdiction		
TCM-1A	HOV Interventions	X	
TCM-1B	Transit and Systems Management Interventions	X	
TCM-1C	Information-based interventions	X	
LONG-TERM MEASURES			
LT1	Tier I		3
LT2	Tier II		3

1—Unknown control methods.
2—No emission reductions from these measures are claimed.
3—Unknown sources.

BENEFITS

Better air quality will improve visibility and reduce adverse impacts to human health, building materials, crops, and livestock. Some of these effects can be measured and are quantified in monetary terms relative to the baseline "no control" scenario for the benchmark years as defined in the air quality models.

Quantifiable Benefits

The benefits of better air quality in terms of improved human health, reduced damage to building materials and crops, and improved visibility were estimated for the 1989, 1991, 1994, and 1997 AQMPs. Those estimates were generally based on previously published studies. The analysis for the draft 2003 AQMP quantifies the benefits of traffic congestion relief and reduced damage to building materials and crops using the same methodology as past AQMPs, but with updated air quality and economic data. These methodologies are discussed below.

Health

Based on numerous epidemiology studies published in recent years, concentration-response functions are developed linking ambient PM10 and ozone concentrations with observed health effects (Chestnut and Keefe, 1996). Epidemiology studies use data on the reported incidence of disease and attempt to discern an association with the concentration of ambient air pollutants measured at the time. The greater breadth of the recent epidemiology literature allows the characterization of more health effects than was possible in the past.

The modeling results from the Urban Airshed Model (UAM) and PM10 Model are used for attainment demonstration (see Appendix V of the draft 2003 AQMP). The UAM and PM10 model project air quality improvements at each geographic grid cell from implementing the draft 2003 AQMP as compared to the baseline conditions absent such control. To estimate health benefits, the results from the UAM and PM10 model were fed into the REHEX-II (Regional Human Exposure) model. The REHEX-II model calculates the increased or decreased exposure (in person-days per year) of the basin's population to PM10 and ozone from the draft 2003 AQMP, compared to baseline levels of these pollutants. These comparisons were made for the years 2006, 2010, and 2020 for PM10 and the years 2010 and 2020 for ozone, using projected population by age cohort and gender from REMI and SCAG and ethnic distribution from the 1990 and 2000 census.[1] The projected change in exposure to PM10 and ozone brought about by implementing the draft 2003 AQMP were then used in the concentration-response functions for specific health effects and for mortality. Finally, the dollar value of improved health and reduced mortality (in terms of willingness to pay to avoid a health effect) was used to quantify these benefits.

[1] The air quality models did not produce air quality data for 2020 as a result of implementing the draft 2003 AQMP. For the purpose of the socioeconomic assessment, the 2010 air quality data was used for 2020. A 2020 baseline based on today's control had to be generated in order to assess the benefit of additional control for that year.

Visibility

The benefits associated with improved visibility are estimated by using a percentage of the public's willingness to pay for improved visibility as determined through housing prices (Beron et al., 2001). This study was conducted at the census tract level and based on matching housing sales data with air quality data and neighborhood statistics in the 1980 and 1990 census in the four-county area. The average willingness to pay per household for visibility improvements reflects the household income net of housing cost, education, and visibility improvements in each tract.

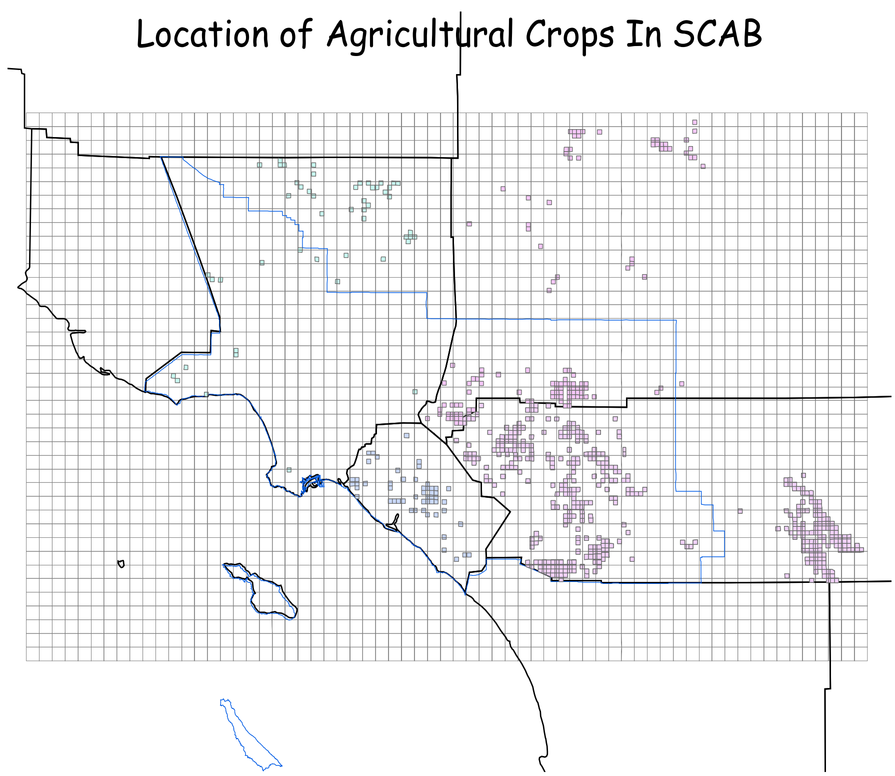
For the draft 2003 AQMP, the willingness to pay for visibility improvement was calculated at the sub-county region level for the benchmark years 2006, 2010, and 2020. The visibility data at the sub-region level was developed by summing the multiplication of the predicted PM10 concentration at each grid by the total light extinction coefficient (in $10^{-4}m^{-1}$) at the nearest airport for that grid across all the grids within a sub-region. The trend on household income and education between the 1990 and 2000 census at the sub-region level was used to develop the values for these two variables for 2006, 2010, and 2020. The projection of the number of households is taken from the SCAG forecast and distributed to sub-regions according to the 2000 census for calculating the total willingness to pay for each sub-region.

The public's willingness to pay as determined through housing prices reflects the value of many benefits including improved health and reduced damage to materials and property as well as improved visibility. In an effort to avoid the double counting of those other benefits and account for the visibility aesthetics only, this analysis attributes only 45 percent of the total willingness to pay factor to visibility. The determination to use a 45 percent factor is based upon a 1994 study prepared by Loehman et al.

Agriculture

The development of increased yield for various crops as a result of better air quality was performed at the gridded level. This was made possible by spatially joining the acreage data for each of these crops at the 1-mile by 1-mile grid level with the air quality data at the 5-kilometer by 5-kilometer level. The analysis was then brought to the sub-region level by summing the benefits across all the grids within a region. Figure A-1 shows the mapping of the agricultural area over the air quality modeling grids for the crops of grapes, oranges, lemons, tangerines, beans, field corn, sweet corn, melons, watermelon, potatoes, spinach, tomatoes, cotton, alfalfa, wheat, and avocados.

Figure A-1



Materials

The methodology used to assess material benefit of clean air for the previous AQMPs is used here. The assessment was made at the county level and allocated to sub-regions based on population or household counts. The basinwide peak 1-hour ozone data (somewhere in South Riverside County) was used to assess the benefit associated with less frequent replacement of tires (McCarthy et al, 1984). PM10 concentration data at five locations were used to estimate the decreased costs of repainting wood and stucco (Murray et al., 1985) and cleaning indoor surfaces (Cummings et al., 1985).

Traffic Congestion Relief

Congestion reduces operating speeds of vehicles, thus resulting in travel delays and increased shipping and storage costs for businesses. Congestion also prevents vehicles from operating under their optimum conditions and thereby increases the operating and maintenance costs of vehicles. Using various studies on congestion costs (SCAG, 2002 and Association of Bay Area Governments, 2002) and potential reductions in vehicle miles traveled (VMT) and vehicle hours traveled (VHT), congestion benefits in the form of reduced vehicle operating and maintenance expenditures and value of lost time due to the draft 2003 AQMP were assessed at the sub-region level. Data on reductions in VMT and VHT were provided by SCAG.

Unquantifiable Benefits

Full quantification of health effects is hindered by the lack of known quantitative relationships between pollutant concentrations and the incidence of health effects. In some cases, these quantitative relationships may be known, but the air quality data needed to perform the calculations may be uncertain.

Further establishment of relationships between poor air quality and its damages, as well as the measurement of these damages, is key to quantifying the benefits from improved air quality in the areas of plant life, livestock, building materials, and human health effects. Inadequate data does not allow full assessments to be made at this time. Benefit assessments which incorporate only quantified benefits significantly underestimate the total benefits which can be expected as a result of implementing the draft 2003 AQMP.

OTHER SOCIOECONOMIC IMPACTS

As control measures in the draft 2003 AQMP are implemented, and as industries spend resources to comply with new requirements and transportation infrastructure is built, the four-county economy will be affected. Implementation of the draft 2003 AQMP could lead to differential impacts on industries and at different times.

REMI Model

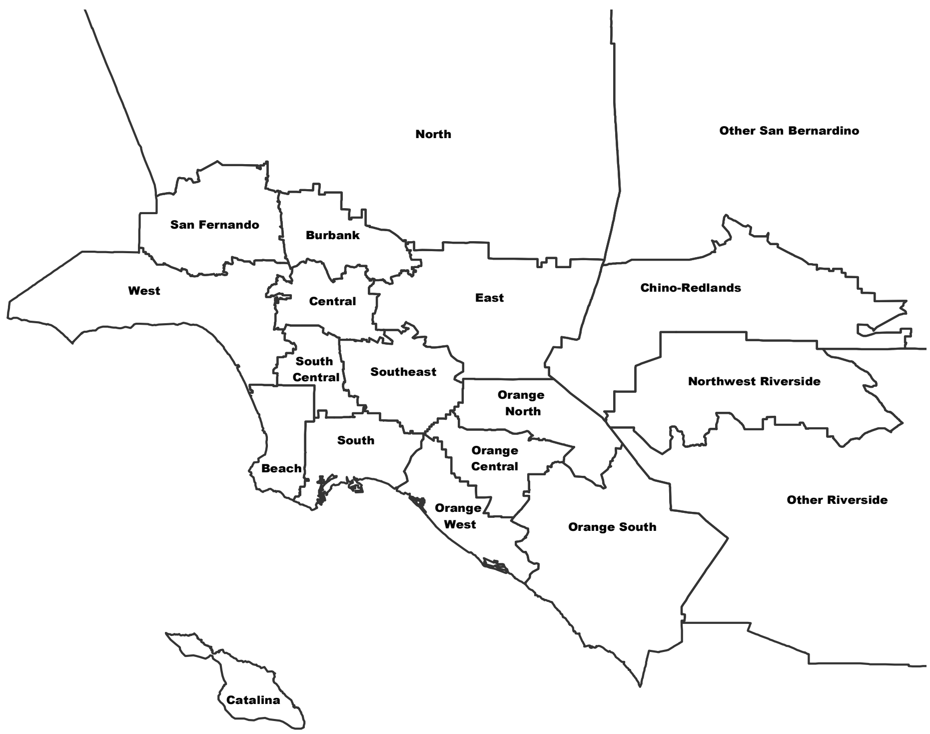
To estimate potential employment impacts and other socioeconomic impacts (e.g., product prices, profits, and income) of quantified measures and benefits, AQMD staff relies on the REMI (Regional Economic Models, Inc.) model. The REMI model is widely used by the U.S. EPA, CARB, other state and local agencies, academicians, and consultants. The REMI model incorporates state-of-the-art modeling techniques and the most recent economic data. The REMI model has been independently evaluated and found to be "technically sound" by the Massachusetts Institute of Technology (Polenske et al., 1992).

The REMI model is built on published data from 1969 to the present with econometrically estimated parameters and can be used to simulate the impact of public policies on the economy of Los Angeles, Orange, Riverside, and San Bernardino Counties. The REMI model allows an assessment of the economic impacts that a policy (such as an AQMP revision or a proposed rule) may cause to each sub-region economy (Figure A-2) for 53 industries which correspond to two-digit standard industrial classification (SIC) codes. These impacts include those on jobs, costs of inputs in the production process, personal income, gross regional product, and product prices. A detailed description of the REMI model is in Appendix B.

Impact analyses in the REMI model follow a two-step process. First, the national economic projection provided by the Bureau of Labor Statistics (BLS) is used to determine the local baseline economic forecast without any policy change. Second, the direct costs and benefits of a policy are input to the REMI model to generate an alternative forecast for the local economy with the policy. The difference between the baseline and alternative forecasts gives the total effects of the policy. The baseline forecast is recalibrated to ensure consistency with SCAG's population and employment forecasts. Appendix C provides a detailed description of the recalibration process.

Figure A-2

Analysis Domain



The assessment of job and other socioeconomic impacts was separately performed for quantified control measures and clean air benefits. This is because only costs associated with 30 percent of required emission reductions for attaining air quality standards were identified. On the other hand, all required emission reductions were used for assessing the clean air benefit. The uncertainty associated with the remaining 70 percent of emission reductions makes the combined assessment of implementing control measures and the resulting clean air benefit less reliable.

Input to REMI

To estimate employment impacts from quantified measures, direct costs associated with each of the control measures were utilized as inputs into the model. Implementation costs of measures were distributed in two ways. First, they were distributed to the regulated industries based on the proportion of emission reductions of these industries by geographic location, as proposed in the draft 2003 AQMP. These costs are the additional cost of doing business. Second, these costs are additional sales to industries which supply necessary equipment and services. These sales were assumed to occur where the regulated industries are or where emission reductions would take place. The analysis is performed from the implementation year of a control measure to the year 2020.

In addition to the categories already described, a number of benefits from clean air were quantified and input into the REMI model. These benefits are estimated for those benchmark years when air quality data was available. To provide continuous forecast estimates, estimates for years between benchmark years were interpolated linearly. Quantifiable benefits include increased crop yields, improved visibility, reduced damages to materials and health, and relief of traffic congestion. Increased crop yields were divided among cotton, food grains, feed grains, fruits, tree nuts, vegetables, sugar crops, oil-bearing crops, and miscellaneous crops. Visibility improvements and reductions in mortality were translated into additional amenities to the four-county area. Reductions in morbidity would lead to reduced health care expenditures by the general public and employers (the out-of-pocket portion only). The same amount of the expenditures was assumed to flow back to the economy in the form of additional spending on other consumption categories. Congestion relief benefits were input as a decrease in the cost of doing business for the trucking and warehousing industry and a decrease in sales for auto repair services. Better traffic flow would result in reduced demand for transportation services. Consumers were assumed to re-spend the savings from vehicle operation and maintenance on other consumption goods. Both the portion of the willingness to pay beyond the out-of-pocket cost in the morbidity benefit for the public and the congestion relief benefit to the owners of light-duty vehicles and commuters were also translates into additional amenities.

Output from REMI

To assess the impacts on socioeconomic groups, the impacts on product prices identified by the REMI model were overlaid on consumption patterns of various income groups to examine the changes in consumer price indexes of these income groups. The data on consumption patterns are from the Bureau of Labor Statistics' Consumer Expenditure Survey. In addition, the ethnic distribution of the workforce in various industries was adjusted to account for differences in job displacement by ethnic group, based on an extensive literature review and survey data on job displacement and re-employment rates of various ethnic groups (Kletzer and Ong, 1994).

To assess the impacts of a policy on the competitiveness of the four-county region, the following factors were evaluated: the region's share of national jobs in those industries whose products are also sold in the national market, the impacts on product prices and profits by industry, and the changes in imports and exports. These factors were selected based on a review of effects of past public policies on a region's competitiveness.

APPENDIX B

THE REMI MODEL

Introduction
Framework of the REMI Model
Assumptions of the REMI Model
Verification of the Model
Enhancements to the Model

INTRODUCTION

In an effort to expand socioeconomic impact assessments for proposed rules and AQMP revisions, the AQMD has been using a computerized economic model from Regional Economic Models, Inc. (REMI) to assess the socioeconomic impacts on the four-county economy since 1990. The REMI covers the geographic area within the counties of Los Angeles, Orange, Riverside, and San Bernardino. The structure and assumptions of the model are briefly described below.

FRAMEWORK OF THE REMI MODEL

The AQMD's REMI model links the economic activities in the counties of Los Angeles, Orange, Riverside, and San Bernardino. The model used for the 2003 AQMP assessment is unique in that each county is further divided to account for the politically, socially, economically, and geographically diversified structure of Southern California economy. There are 11 sub-county regions in Los Angeles County, four in Orange County, two in Riverside County, and two in San Bernardino County. The divisions of the sub-regions were developed in 1996 and based on the 1990 census.

The REMI model in each sub-region is comprised of a standard module, a demographic/migration module, and an input-output module. The standard module has 53 industries (2-digit SIC), 94 occupations, and 25 final demand sectors. The demographic/migration module captures population changes due to births, deaths, and migration; and has 202 age/sex cohorts. The input-output module contains detailed inter-industry relationships for 466 sectors. The input-output module is used to assess the detailed inter-industry effects of a policy change. The effects are then fed into the standard module to allow for the assessment of total effects.

The standard module can be divided into the following five components: (1) production (output); (2) labor and capital demand; (3) population and labor supply; (4) wages, and prices, and profits; and (5) market share. These five components are interrelated and the linkages are depicted in Figure B-1.

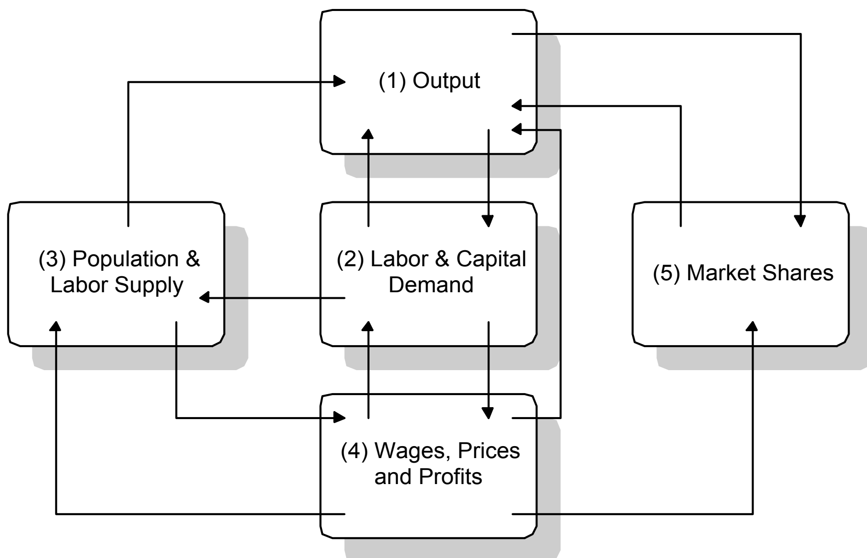
Each component is built upon a two-step process. First, producers and consumers throughout all regions of the country have similar behavioral characteristics. Because of these similarities, statistical techniques can be used to estimate economic responses based on studies done throughout the United States. The second step of the modeling process is region specific, and involves calibration of the model based on region-specific historical data.

ASSUMPTIONS OF THE REMI MODEL

The REMI model has been built based on well-established economic theory and is updated regularly to incorporate new findings in economic theory and new historical data. Major assumptions behind the REMI model fall into the following three categories: overall, production, and population and labor. The major assumptions behind the REMI model are as follows.

FIGURE B-1

Components of REMI Model



Overall

1. Production costs, such as capital equipment, labor and fuel, are allowed to be substituted based on the changes in relative costs of these inputs to those in the United States. Total production costs are the sum of input costs weighted by their usage.

2. Location of a firm is driven by profitability.

3. All industries sell to both local and national markets. The model calculates the proportions of local demand that an industry can satisfy and its export share. Exports are divided into shipments from one county to the remaining counties (e.g., counties of Los Angeles, Orange, Riverside, and San Bernardino) and sales outside of the four-county region.

4. For pricing purposes, industries are classified as national or regional. Goods sold in national markets must be priced at the average national price to be competitive. National industries, on average, supply more than 50 percent of their output to national markets. Regional industries sell more than 50 percent of their output locally. The national industries in the model are hotels and manufacturing sectors with the exception of stone, clay, and glass; printing and publishing; and petroleum and coal products. The regional industries consist of mining, construction, finance, wholesale and retail trade, services (except hotels), and agriculture.

5. The REMI model consists of exogenous and endogenous economic variables. Values of exogenous variables are determined outside of the model. Exogenous variables are a driving force of change in the regional economy. The resulting changes are reflected in the values of endogenous variables calculated by the model. Therefore, policy changes can be simulated by changing exogenous variables whose values are developed by District staff as inputs to the REMI model. For example, increases in demand for control equipment due to a rule can be simulated by increasing the sales of the supplier of control equipment. The impact of such a policy change includes changes in employment, among others.

6. There will be two avenues for market expansion. First, as the cost of production decreases, firms become more competitive in the export market and more competitive with imports. Second, markets are assumed to expand as a region's economy grows.

Production

1. Production costs affect regional competitiveness which impacts the shares of local and export markets. As the relative production costs increase, there will be a reduction in the proportion of local demand which can be satisfied locally as imported goods are substituted for local goods.

2. Production levels drive labor demand which interacts with labor supply to determine wage rates. Combined with other production costs, e.g., capital and fuel costs, wages determine relative production costs in the four-county region compared to the rest of the United States.

3. Production levels are determined by the total demand which consists of consumption, investment, government spending, and net exports. Employment is determined by the level of production and labor intensity, i.e., number of employees per unit of production.

4. An increase in demand will increase production by a factor greater than one because of indirect impacts.

Population and Labor

1. There are four types of migrants: international migrants, retired migrants, former military personnel, and economic migrants. These economic migrants are individuals moving to the region for employment opportunities. They respond to both economic and amenity factors.

2. The demographic section of the model predicts the number of births and deaths that occur in the population. Labor supply is derived from the indigenous labor force and potential job migrants.

3. Labor is segmented by occupation as well as by industry. Employment within an industry is translated to occupation level employment through the use of occupational skill requirements by industry.

VERIFICATION OF THE MODEL

The REMI model for the Southern California geography was independently evaluated by the University of Pittsburgh in 1989 to determine its forecasting and simulation capabilities. The model's performance was judged to meet accepted standards of practice (Cassing and Giarratani, 1992).

ENHANCEMENTS TO THE MODEL

The AQMD's socioeconomic assessment process is an evolving one. The assessment has expanded from impacts on directly affected industries to include employment impacts on all industries. In 1992, enhancements were made to the REMI model to allow the assessment of impacts on different income groups and on low- versus high-wage groups.

Using the nationwide median weekly earnings of full-time workers from the 1998 Bureau of Labor Statistics (BLS) Current Population Survey (CPS), 94 occupations in the REMI model were ranked in ascending order of earnings and divided into five equal (quintile) groups. Table B-1 shows how the 94 civilian occupations were ranked:

TABLE B-1

Ranking of Occupational Earnings

Occupation	Median Weekly Earnings	Quintile Group
Private Household Workers	$223	1
Cashiers	$267	1
Farm Occupations	$285	1
Food Prep. & Service Workers	$288	1
Textile & Related Operators	$293	1
Counter & Rent Clerks	$296	1
Stock Clerks, Sales Workers	$296	1
Fishers, Hunters, & Trappers	$302	1
Other Agricultural-related Workers	$302	1
Non-farm Gardeners	$306	1
Non-farm Animal Care Workers	$308	1
Other Sales Workers, Nec.	$311	1
Personal Service Workers	$311	1
Retail Salespersons	$312	1
Health Service Workers	$318	1
Cleaning Workers	$319	1

Table B-1 (Continued)

Occupation	Median Weekly Earnings	Quintile Group
Other Service Workers, Nec.	$327	1
Mail Clerks & Messengers	$346	1
Hand Helpers, Laborers	$351	2
Information Clerks	$367	2
Woodworking Machine Operators	$379	2
Precision Textile, Apparel Workers	$387	2
Communication Equipment Operators	$397	2
Comb. Machine Tool Operators	$399	2
Machine Tool Cut & Form Operators	$399	2
Metal Fabrication Machine Operators	$399	2
Numerical Control Machine Tool Operators	$399	2
Precision Food Workers	$401	2
Other Clerical Workers, Nec.	$401	2
Other Precision Workers, Nec.	$402	2
Precision Assemblers	$402	2
Precision Print Workers	$402	2
Forestry & Logging Occupations	$414	2
Other Machine Operators, Nec.	$416	2
Non-Financial Record Processing Workers	$417	2
Hand Workers	$421	2
Farm Operators & Managers	$424	2
Secretaries, Stenographers, & Typists	$437	3
Recording, Scheduling, and Dispatching Workers	$446	3
Travel Agents	$463	3
Supervisors, Farm, Forest, & Agriculture	$469	3
Adjustment, Investment, & Collections Occupations	$470	3
Precision Woodworkers	$475	3
Metal & Plastic Machine Operators	$475	3
Printing, Binding & Related Workers	$495	3
Health Technicians & Technology Occupations	$502	3
Motor Vehicle Operators	$503	3
Material Moving Operators	$505	3
Other Transportation Operators, Nec.	$510	3
Computer & Related Equipment Operators	$511	3
Construction Trades Occupations	$543	3
Vehicle, & Mobile Equipment Mechanics	$552	3
Soc., Recreation, & Religious Workers	$557	3
Other Mechanical, Installers, Nec.	$584	3
Water & Liquid Waste Occupations	$586	3
Communication Equipment Mechanics, Installers	$597	4
Protective Services Occupations	$598	4
Blue Collar Workers Supervisors	$599	4

Table B-1 (Continued)

Occupation	Median Weekly Earnings	Quintile Group
Postal Clerks, & Mail Workers	$603	4
Machinery & Related Mechanics, Installers	$608	4
Precision Metal Workers	$610	4
Financial Record Processing Workers	$616	4
Precision Inspectors, Testers	$623	4
Insurance Sales Workers	$629	4
Mining, Quarrying Occupations	$633	4
Oil & Gas Extraction Occupations	$633	4
Other Extraction Occupations, Nec.	$633	4
Engineering & Science Technicians	$638	4
Writers, Artists, Entertainers	$647	4
Management Support Occupations	$660	4
Real Estate Agents	$663	4
Elec. Equip. Mechanics, Installers	$665	4
Teachers, Librarians, & Counselors	$671	4
Chemical Plant & System Operators	$694	5
Electric Power Operators, Distribution Workers	$694	5
Gas & Petroleum Plant Workers	$694	5
Other Plant & System Operators, Nec.	$694	5
Stationary Engineers	$714	5
Other Technicians	$738	5
Health Assessment & Treatment Occupations	$738	5
Life Scientists	$739	5
Managerial and Administrative Occupations	$755	5
Social Scientists	$758	5
Secur. & Fin. Srvcs. Workers	$758	5
Other Professional Workers, Nec.	$763	5
Physical Scientists	$828	5
Water Transportation Workers	$849	5
Rail Transportation Workers	$849	5
Architects & Surveyors	$872	5
Computer, Math., and Operations Research Analysts	$938	5
Engineers	$992	5
Health Diagnosing Occupations	$1,134	5
Lawyers	$1,209	5
Judges, Magistrates	$1,218	5

Nec. means not elsewhere classified.

In doing so, the percentage changes of a policy on each quintile of earnings can thus be reported for occupational wage rate, employment, and wage bill.

The ES-202 data (excluding self-employment) from the BLS for the four-county area provides the average annual wage per worker (full-time and part-time) for the 49 private non-farm industries at the 2-digit SIC level in the REMI model. By ranking the 49 industries in ascending order of the average annual wage per worker, we can divide them into five equal groups, as shown in Table B-2:

TABLE B-2

Ranking of Wages by Sector

Sector	SIC	Average Annual Wage	Quintile Group
Personal Services & Repair	72,76	$8,470	1
Agri., Forest, Fish.,Hunt. Services	7-9	$11,918	1
Eating & Drinking Places	58	$12,202	1
Private Households	88	$12,330	1
Real Estate	65	$15,280	1
Auto Repair/Services/Parking	75	$17,850	1
Rest of Retail	52-57,59	$18,056	1
Amusement & Recreation	79	$18,087	1
Education	82	$18,262	1
Apparel	23	$18,504	1
Local Transit/Interurban Transport.	41	$18,989	2
Hotels	70	$19,127	2
Leather	31	$20,273	2
Non-profit Organizations	83	$21,219	2
Trucking	42	$21,853	2
Furniture	25	$22,146	2
Misc. Manufacturing	39	$22,209	2
Tobacco Manufacturing	21	$22,312	2
Construction	15-17	$22,365	2
Lumber	24	$23,010	2
Textiles	22	$25,284	3
Misc. Business Services	73	$26,553	3
Fabricated Metal	34	$29,288	3
Stone, Clay, etc.	32	$30,423	3
Other Transportation	46,47	$30,887	3
Rubber	30	$31,010	3
Motor Vehicles	371	$32,139	3
Medical	80	$32,391	3
Food	20	$32,791	3
Primary Metals	33	$32,828	3
Printing	27	$34,099	4
Misc. Professional Services	81	$35,704	4
Air Transportation	45	$36,017	4

TABLE B-2 (CONTINUED)

Sector	SIC	Average Annual Wage	Quintile Group
Wholesale	50,51	$39,295	4
Mining, Oil/Gas Extraction	10,12-14	$40,276	4
Credit & Finance	61,62	$40,436	4
Paper	26	$40,661	4
Insurance	63,64	$46,186	4
Chemicals	28	$46,828	4
Communications	48	$48,830	4
Electrical Equipment	36	$49,503	4
Rest of Transportation Equipment	372-379	$49,596	5
Motion Pictures	78	$51,680	5
Public Utilities	49	$52,829	5
Non-electrical Mach., Computers	35	$53,485	5
Instruments	38	$55,876	5
Banking	60	$56,075	5
Railroad Transportation	40	$56,683	5
Petroleum Products	29	$81,859	5

The percentage change in employment, wage bill, and wage rate resulting from a policy can thus be reported for each quintile of wages, by sector.

The annual Consumer Expenditure Survey (CEX), published by the BLS, provides a continuous flow of information on the buying habits of American households. The CEX reports average annual expenditures and characteristics of households by income group. There are five income groups: from the households earning the top 20 percent of income to those earning the bottom 20 percent of income.

By linking consumption expenditures in the REMI model with spending patterns of the eight income groups in the CEX, we can then develop a composite price change for consumer goods for each income group.

APPENDIX C

ADJUSTMENT OF THE REMI CONTROL FORECAST

The 2003 AQMP uses SCAG's forecasts on population, employment, and other economic variables for future emission projections (Health and Safety Code Section 40460). The REMI model is used in the AQMP to generate a baseline forecast from which the effects of a policy are evaluated. The REMI and SCAG forecasts use different data inputs and assumptions.

An audit of the AQMD's socioeconomic analysis methods by Massachusetts Institute of Technology recommended further evaluation of the inconsistency between the REMI and SCAG forecasts. AQMD and SCAG commissioned the Center for the Continuing Study of the California Economy (CCSCE, 1994) to determine the sources of inconsistency between these forecasts. The CCSCE recommended a three-step process to ensure consistency between REMI and SCAG forecasts.

- REMI and SCAG should use the same U.S. projections for population and employment
- REMI and SCAG should use the same birth rates by age cohort
- REMI and SCAG models should use similar rates of growth for employment projections

The 2001 release of the REMI model was adjusted in 2001 in preparation for work on the 2003 AQMP. This version of the REMI model has the same U.S. population projections as the SCAG model. The U.S. employment growth is at one percent annually until 2020 in both models. Therefore, no further adjustment to the REMI U.S. forecast is needed.

SCAG's birth rates for four race/ethnicity groups (White, Black, Hispanic, Other) and five-year age cohorts for each of the four counties were incorporated into the REMI model from 1999 to 2020. Birth rates for a particular county were used for its sub-regions.

After such replacement the REMI and SCAG models continued to project different levels of employment due to definitional differences in employment data. The REMI model uses employment data published by the Bureau of Economic Analysis (BEA) while SCAG uses data published by the Bureau of Labor Statistics (BLS). The major difference between these two data sources lies in military personnel and the self-employed. The BEA data include federal military jobs and a much higher estimate of the self-employed than the BLS data. The self-employed are embedded in the estimates of sectoral employment in the BEA but are listed separately from the sectoral employment in the BLS.

Export shares of key local industries were modified in the REMI model to narrow the difference in employment growth rates between the two models. The key industries were those that were major contributors to the difference in employment growth rates at the county level between the two models. The key industries vary by sub-region.

Additionally, a special adjustment was made to the number of migrants entering Los Angeles County to account for the population differences between the two models. Adjustments to the employment growth rates and population were carried out iteratively to ensure that the percentage change in employment for the periods of 1997-2010 and 2010-2020 be consistent between the two models at the county level.

Table C-1 shows the region-wide difference in population between 2010 and 2020 between the unadjusted and adjusted REMI and the SCAG forecasts. Table C-2 compares the employment growth rates between the unadjusted and adjusted REMI and SCAG forecasts for the periods of 1997-2010 and 2010-2020. The difference of the employment growth rates of the two forecasts is less than one percentage point for the four-county region.

TABLE C-1

Adjusted REMI versus SCAG Population Comparison

	2010			2020		
	U Adj. REMI	Adj. REMI	SCAG	U Adj. REMI	Adj. REMI	SCAG
4-county total	17,040,000	18,084,000	18,016,000	18,307,000	20,077,000	20,124,000
	(-5.42%)	(0.38%)		(-9.03%)	(-0.23%)	

The figures in parentheses are the percentage differences between REMI and SCAG population forecasts.

TABLE C-2

Adjusted REMI versus SCAG Employment Comparison (in percentage growth)

Region	1997-2010			2010-2020		
	U Adj. REMI	Adj. REMI	SCAG	U Adj. REMI	Adj. REMI	SCAG
Los Angeles	24.90%	14.42%	13.50%	6.59%	4.95%	5.44%
Orange	25.39%	35.10%	35.80%	6.63%	10.67%	9.93%
Riverside	27.27%	73.69%	74.08%	9.70%	18.66%	19.61%
San Bernardino	23.65%	62.00%	61.07%	7.87%	17.20%	18.19%
Four County Total	25.06%	26.49%	25.87%	6.92%	8.73%	9.04%

APPENDIX D

GLOSSARY

Air Quality Investment Program (AQIP): An emission reduction option in which monies collected by the AQMD from affected facilities are used to fund emission reduction programs that have been approved by the AQMD Governing Board.

Census of Population: The U.S. Constitution provides for a census of the population every 10 years. The 1990 census includes information on population, household, housing, race and ethnicity, economy, and education.

Acute Health Effect: An adverse health effect that occurs over a relatively short period of time (e.g., minutes or hours).

Acute Respiratory Symptoms: Any respiratory disease-related symptoms including chest discomfort, coughing, wheezing, sore throat, head cold, chest cold, sinus trouble, hay fever, headache and doctor-diagnosed flu.

Air Quality Simulation Model: A computer program that simulates the transport, dispersion, and transformation of compounds emitted into the air and can project the relationship between emissions and air quality.

Ambient Air: The air occurring at a particular time and place outside of structures. Often used interchangeably with "outdoor" air.

APCD (Air Pollution Control District): A county agency with authority to regulate stationary, indirect, and area sources of air pollution (e.g., power plants, highway construction, and housing developments) within a given county, and governed by a district air pollution control board composed of the elected county supervisors. (cf. AQMD).

AQMD (Air Quality Management District): A group or portions of counties, or an individual county specified in law with authority to regulate stationary, indirect, and area sources of air pollution within the region and governed by a regional air pollution control board comprised mostly of elected officials from within the region. (cf. APCD).

AQMP (Air Quality Management Plan): A Plan prepared by an APCD/AQMD, for a county or region designated as a non-attainment area, for the purpose of bringing the area into compliance with the requirements of the national and/or California Ambient Air Quality Standards. AQMPs are incorporated into the State Implementation Plan (SIP).

ARB (California Air Resources Board): The State's lead air quality agency consisting of a nine-member Governor-appointed board. It is responsible for attainment and maintenance of the State and federal air quality standards, and is fully responsible for motor vehicle pollution control. It oversees county and regional air pollution management programs.

Asthma Symptom Days: Days in which asthma symptoms are present in asthmatic individuals.

CAA (Federal Clean Air Act): A federal law passed in 1970 and amended in 1977 and 1990 which forms the basis for the national air pollution control effort. Basic elements of the act include national ambient air quality standards for major air pollutants, air toxics standards, acid rain control measures, and enforcement provisions.

Cardiac Hospital Admissions: Hospital admissions due to heart-related ailments or disease.

CCAA (California Clean Air Act): A California law passed in 1988 which provides the basis for air quality planning and regulation independent of federal regulations. A major element of the Act is the requirement that local APCDs/AQMDs in violation of the CAAQS must prepare attainment plans which identify air quality problems, causes, trends, and the actions to be taken to attain and maintain California's air quality standards by the earliest practicable date.

CEQA (California Environmental Quality Act): A California law which sets forth a process for public agencies to make informed decisions on discretionary project approvals. The process aids decision makers to determine whether any environmental impacts are associated with a proposed project. It requires environmental impacts associated with a proposed project to be identified, disclosed, and mitigated to the maximum extent feasible.

Clean Air Benefits: These are reduced morbidity, avoided mortality, visibility improvements, increased crop yield, traffic congestion relief, reduced spending on refurbishing sensitive building materials, and less damage to plant life and livestock resulting from attaining federal and state air quality standards.

CO (Carbon Monoxide): A colorless, odorless gas resulting from the incomplete combustion of fossil fuels. Over 80% of the CO emitted in urban areas is contributed by motor vehicles. CO interferes with the blood's ability to carry oxygen to the body's tissues and results in numerous adverse health effects. CO is a criteria air pollutant.

Concentration-Response Function: A mathematical relationship derived to calculate the number of cases of a specific health effect expected in a population exposed to a given ambient concentration of an air pollutant.

Chronic Bronchitis: Chronic lung disease characterized by frequent coughing, increased sputum production, and interference with oxygen exchange between air and blood in the lungs of severely affected individuals.

Chronic Health Effect: An adverse health effect which occurs over a relatively long period of time (e.g., months or years).

Consumer Expenditure Survey (CEX): The CEX collects information on the buying habits of American consumers. The survey consists of two components: (1) a Diary survey completed by participating consumers for two consecutive 1-week periods; and (2) an Interview survey in which the expenditures of consumers are obtained in five interviews conducted every 3 months. Each component of the survey queries an independent sample of consumers which is representative of the U.S. population. Over 52 weeks of the year, 5,000 consumers are sampled for the Diary survey. The Interview sample is selected on a rotating panel basis, targeted at 5,000 consumers each quarter.

Current Population Survey (CPS): The CPS provides monthly statistics that serve as measures of both current labor force utilization and the overall performance of the U.S. economy. The information collected from a sample of 60,000 households in the CPS relates to the employment status of the entire population. For the employed, there are data on hours worked, providing information on the full-time and part-time status of workers, and on their usual weekly earnings. For the unemployed, data routinely are collected on duration of unemployment, the respondent's job status at the time that his or her jobless spell began, and jobseeking methods used. Among those not in the labor force, data are obtained for so-called discouraged workers, who have ceased active job hunting.

Discounted Cash Flow Method: A method to evaluate the present worth of a stream of expenditures in future years. Future expenditures are discounted based on the interest rate and the length of the period in which the expenditures are made.

Disposable Income: It is the sum of the incomes of all the individuals in the economy after all taxes have been deducted.

Dose-Response Function: A mathematical relationship which expresses the likelihood of a connection between exposure to a specific amount of an air pollutant (inhaled dose) and one or more responses elicited by the exposure to the specific pollutant. For human health evaluations, responses are health effects, e.g., eye irritations and restricted activity days. For agriculture, the responses are changes in crop yields.

Emergency Room Visits: Visits to emergency rooms by individuals in need of urgent or immediate treatment.

EPA (Environmental Protection Agency): The United States government agency charged with setting policy and guidelines, and carrying out legal mandates for the protection of national interests in environmental resources.

Episodic Model: A photochemical grid model that typically simulates air quality for a 3-5 day period, e.g., the Urban Airshed Model used for the ozone attainment demonstration .

FIP (Federal Implementation Plan): In the absence of an approved State Implementation Plan (SIP), a plan prepared by the EPA which provides measures that non-attainment areas must take to meet the requirements of the Federal Clean Air Act.

Hedonic Prices: Hedonic prices are a method to compute the price of a good that is not traded in the market based on the price of a traded good that has the attribute of the non-traded good. Based on the amount of the attribute, the imputed price of the non-traded good is a fraction of the price of the traded good. For example, air quality is an attribute of real estate.

Mobile Sources: Sources of air pollution such as automobiles, motorcycles, trucks, off-road vehicles, boats and airplanes. (Contrast with stationary sources.)

NAICS Code: The North American Industry Classification System (NAICS) has replaced the U.S. Standard Industrial Classification (SIC) system. NAICS was developed jointly by the U.S., Canada, and Mexico to provide new comparability in statistics about business activity across North America. Economic units that use like processes to produce goods or services are grouped together. NAICS reflects the structure of today's economy in the United States, Canada, and Mexico, including the emergence and growth of the service sector and new and advanced technologies. NAICS also provides for increased comparability with the International Standard Industrial Classification System (ISIC, Revision 3), developed and maintained by the United Nations.

Nitrogen Oxides (Oxides of Nitrogen, NO_x): A general term pertaining to compounds of nitric acid (NO), nitrogen dioxide (NO_2), and other oxides of nitrogen. Nitrogen oxides are typically created during combustion processes, and are major contributors to smog formation and acid deposition. NO_2 is a criteria air pollutant, and may result in numerous adverse health effects.

Off-Road Mobile Sources: Mobile sources of air pollution (vehicles) which are not authorized to operate on streets and highways. Examples include trains, boats, aircraft, farm equipment, and earthmoving equipment.

On-Road Mobile Sources: Mobile sources of air pollution (vehicles) which are authorized to operate on streets and highways. Examples include passenger cars, trucks, and buses.

Ozone: A strong-smelling, pale blue, reactive toxic chemical gas consisting of three oxygen atoms. It is a product of the photochemical process involving the sun's energy. Ozone exists in the upper atmosphere ozone layer as well as at the earth's surface. Ozone at the earth's surface can cause numerous adverse health effects and is a criteria air pollutant. It is a major component of smog.

Ozone Precursors: Chemicals such as hydrocarbons and oxides of nitrogen, occurring either naturally or as a result of human activities, which contribute to the formation of ozone, a major component of smog.

PIC (Particle-in-Cell) Model: An air quality simulation model that is used to apportion sulfate and nitrate PM10 concentrations to their precursor emissions sources. The PIC model uses spatially and temporally resolved sources of NOx and SOx emissions, with meteorological, physical, and simplified chemical processes, to calculate PM10 contributions .

PM10 (Particulate Matter): Major class of air pollutants consisting of tiny solid or liquid particles of soot, dust, smoke, fumes, and mists. The size of the particles (10 microns or smaller, about 0.0004 inches or less) allows them to enter the air sacs (gas exchange region) deep in the lungs where they may get deposited and result in adverse health effects. PM10 also causes visibility reduction and is a criteria air pollutant.

PM10 Model: Modeling approaches required to assess contributions to primary and secondary PM10. The primary PM10 source apportionment can be accomplished by receptor models and the secondary particles such as sulfate and nitrate can be apportioned to their precursors utilizing the Particle-In-Cell (PIC) dispersion model.

Premature Mortality: Death before the term duration of life expected.

Quantifiable Clean Air Benefits: Clean air is not a commodity exchanged in a market. The contingency valuation method or the hedonic pricing is often used to assess the monetary benefit associated with clean air. There are instances where association between an effect and clean air (cause) cannot be quantitatively established or is unknown, thus precluding the application of the contingency valuation method or the hedonic pricing. Quantifiable clean air benefits are those benefit categories where monetary values can be placed based on past literature.

REHEX Model (Regional Human Exposure Model): A computer model designed to estimate general population exposures to air pollutants. The model uses air quality data from the Urban Airshed Model as inputs for exposure calculations. The model is structured in a manner that allows for consideration of spatial and temporal variations in concentrations, the variations in human time activity, and the mobility of the population.

REMI (Regional Economic Models, Inc.) Model: The REMI model is an economic and demographic forecasting and simulation model designed to examine the economic and demographic effects resulting from policy initiatives or external events in a local economy. For the socioeconomic analysis of the 2003 AQMP, the REMI EDFS-53 sector model for the 19 sub-regions within the counties of Los Angeles, Orange, Riverside, and San Bernardino is used.

Respiratory Hospital Admissions: Hospital admissions due to respiratory illness.

Restricted Activity Days: Days when activities are either fully or partially restricted due to illness, which include days spent in bed and days missed from work.

ROG (Reactive Organic Gas): A reactive chemical gas, composed of hydrocarbons, that may contribute to the formation of smog. Also sometimes referred to as Non-Methane Organic Compounds (NMOCs) or volatile organic compounds (VOCs).

SIC Code (Standard Industrial Classification Code): The SIC code is used to classify all establishment-based federal economic statistics by industry. The SIC code facilitates the comparability of establishment data in the U.S. economy. The classification covers the entire range of economic activities and defines industries in accordance with the composition and structure of the economy.

SIP (State Implementation Plan): A document prepared by each state describing existing air quality conditions and measures which will be taken to attain and maintain national ambient air quality standards (see AQMP).

Smog: A combination of smoke, ozone, hydrocarbons, nitrogen oxides, and other chemically reactive compounds which, under certain conditions of weather and sunlight, may result in a murky brown haze that causes adverse health effects. The primary source of smog in California is motor vehicles.

SO_2 (Sulfur Dioxide): A strong smelling, colorless gas that is formed by the combustion of fossil fuels. Power plants, which may use coal or oil high in sulfur content, can be major sources of SO_2. SO_2 and other sulfur oxides contribute to the problem of acid deposition. SO_2 is a criteria pollutant.

Stationary Sources: Non-mobile sources such as power plants, refineries, and manufacturing facilities which emit air pollutants. (Contrast with mobile sources.)

UAM (Urban Airshed Model): The three dimensional photochemical grid model used to simulate ozone formation.

VHT: Vehicle Hours Traveled.

VMT: Vehicle Miles Traveled.

Visibility: The distance that atmospheric conditions allow a person to see at a given time and location. Visibility reductions from air pollution are often due to the presence of sulfur and nitrogen oxides, as well as particulate matter.

VOCs (Volatile Organic Compounds): Hydrocarbon compounds which exist in the ambient air. VOCs contribute to the formation of smog and/or may themselves be toxic. VOCs often have an odor. Some examples of VOCs are gasoline, alcohol, and the solvents used in paints.

Willingness to Pay (WTP): WTP is an approach to measuring monetary values of benefits received from non-market goods such as environmental quality. The methods used to arrive at a WTP value include surveys and hedonic price functions.

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